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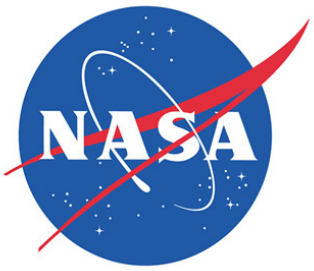

Operations & Maintenance Cost Study for NASA Facilities

Final Report for Wind Tunnels

August 13, 2015

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Overview

National Aeronautics and Space Administration (NASA) requires a credible method for estimating the operations and maintenance (O&M) requirements of its facilities.[1] The failure to anticipate future costs can lead to under-funding and diminished service life.

NASA has over 1,100 buildings totaling 18.4 million GSFT distributed at 33 sites globally in the selected inventory for this project. It is not cost effective to inspect all facilities, yet NASA needs detailed sustainment and operations estimates to support its budget planning. This project developed cost models for a sample of NASA assets with inventory details collected through site surveys. Estimates were extrapolated by facility type and size and adjusted for location to generate requirements for the selected NASA inventory.

The project employed the MARS Facility Cost Forecast System to provide cost information. Now in its eighth version, MARS is a facility cost modeling tool developed by CBRE | Whitestone and used by many federal and commercial agencies.

Completed in March 2013, Phases 1 and 2 of this project estimated O&M costs for four facility types: Administration Buildings, Propulsion Buildings, Communications Buildings, and Space Science (R&D and Test) Buildings. Eight sample buildings were inspected at Goddard and Marshall Space Flight Centers. CBRE | Whitestone submitted formal reports for each facility type.

Phase 3 inspected a sample of two Wind Tunnel facilities at Glenn Research Center (GRC) in Cleveland, Ohio and generated detailed models in MARS. Site inspections were conducted by Jacobs Facilities, a long-time CBRE | Whitestone partner experienced in inspecting federal facilities and creating MARS component inventories. A team consisting of an architect, and electrical and mechanical engineers carried out the facility inspections.

O&M estimates from the sample were extrapolated to the remaining Wind Tunnels in the NASA inventory. The unique function of Wind Tunnels makes common extrapolation variables (per square foot or replacement value) ineffective. Key cost drivers identified by NASA and CBRE | Whitestone dictated how estimates for the sample assets were applied to the total inventory.

This report describes the project methodology and presents final estimates for the Wind Tunnels in the NASA inventory.

[1] Operations include custodial (cleaning, pest control, and trash collection), utilities (energy, water, and sewer), grounds (landscape care, mowing, and snow removal), security, telecommunications, and management. Maintenance (also known as sustainment) includes preventative maintenance, minor repair, unscheduled maintenance, and renewal and replacement.

Project Methodology

Parametric Estimates for Buildings

The project methodology entailed estimating O&M requirements for the selected NASA inventory based on the inspection and modeling of a sample of facilities. The project included five key steps:

1. Validate the existing NASA inventory and develop a sample
2. Perform on-site inspections of the sample buildings
3. Develop and calibrate MARS models
4. Develop a mapping and extrapolation methodology and variables for the unique function of Wind Tunnels
5. Generate estimates of sustainment and operations costs for the sample and extrapolate to the project inventory

Study Sample

NASA has over 1,100 buildings at 33 sites globally in the selected inventory. Complete inspection of each site to estimate O&M requirements is impractical and costly. This project generated sustainment and operations estimates for a sample of buildings and extrapolated the costs to a selected NASA inventory.

NASA selected 23 Wind Tunnel facilities distributed at four sites for this project. The project sample included the inspection of one small supersonic and one large subsonic Wind Tunnel. Staff at NASA HQ, the Aeronautics Test Program, and CBRE | Whitestone selected two Wind Tunnels at the GRC to minimize travel costs for the inspection. Component-level cost models were developed for the two tunnels using CBRE | Whitestone's MARS. The project inventory excluded other Classification types in the NASA inventory, such as Warehouses. Estimates for Administration, Propulsion, Communications, and Space Science (R&D and Test) Buildings were generated in Phases 1 and 2 of the project.

Table 1 shows the building detail for the inspected Wind Tunnels.

Table 1. Wind Tunnels Inspection Sample

Site	Classification	Property No.	Property Name	Year Built	Size[A]	CRV[B]
Glenn Research Center	Wind Tunnels	39/53/54/57/61	9'x15' Low Speed / 8'x6' Supersonic Wind Tunnel	1949	119,514	$106,691,109
	Wind Tunnels	37	1'x1' Supersonic Wind Tunnel	1942	7,479	$6,608,331
Total					**126,993**	**$113,299,440**

[A] Size is the approximate GSFT associated with the wind tunnel from site inspections. GSFT of entire property may exceed inspection sample.
[B] CRV is the Current Replacement Value of the entire property and may exceed the value of the inspected area.

The inspected sample was mapped to the remaining inventory. There are a number of variables that drive O&M costs. In Phase 1 and 2 of the project, building Classification type and size were the key inputs used to determine appropriate mapping of sample facilities to the total inventory. The unique systems and function of the Wind Tunnels prevent O&M costs from closely aligning with facility square footage. NASA and CBRE | Whitestone defined several variables and associated factors used to map the sample models and extrapolate total O&M costs to the remainder of the inventory. The Wind Tunnel mapping and extrapolation is described in detail in a later section of this report.

The 23 Wind Tunnels selected for this project represent 1.2 million GSFT with a $2.9 billion CRV. Table 2 shows the Wind Tunnels inventory by site.

Table 2. NASA Wind Tunnels by Site

Site	Property No.	Property Name	Size[A]	CRV[B]
AMES Research Center	N206/N206A	12' Pressure Tunnel	36,364	$253,246,932
AMES Research Center	N215	7' X 10' Subsonic Wind Tunnel #1	28,763	$36,488,779
AMES Research Center	N221/N221B	National Full Scale Aerodynamics Complex (NFAC) 40' X 80' & 80' X 120'	171,129	$529,305,708
AMES Research Center	N227A/N227B/N227C	11' X 11', 9' X 7', & 8' X 7' Unitary Plan Transonic Wind Tunnel	53,580	$322,857,273
Glenn Research Center	11/170	Icing Research Tunnel	32,501	$60,139,291
Glenn Research Center	37	1' X 1' Supersonic Wind Tunnel	7,479	$6,608,331
Glenn Research Center	39/53/54/57/61	9' X 15' Low Speed Wind Tunnel/8' X 6' Supersonic Wind Tunnel	119,514	$106,691,109
Glenn Research Center	85/87/88/90/113/114	10' X 10' Abe Silverstein Wind Tunnel	170,941	$297,274,694
Langley Research Center	1212C	14' X 22' Subsonic Wind Tunnel	51,354	$90,413,562
Langley Research Center	1236	National Transonic Facility (NTF)	79,745	$393,554,794
Langley Research Center	1242	0.3 Meter Cryogenic Tunnel	9,276	$13,304,480
Langley Research Center	1247D	20" Mach 6 Tunnel	100,360	$141,019,520
Langley Research Center	1251	Unitary Plan Wind Tunnel Test Section 1 & 2	134,535	$308,493,730
Langley Research Center	1251A	15" Mach 6 High Temperature Tunnel (Hyper. Flow App.)	24,312	$3,161,438
Langley Research Center	1251A	31" Mach 10 Tunnel	24,312	$3,161,438
Langley Research Center	1265	8' High Temperature Tunnel	25,517	$124,241,924
Langley Research Center	1275	20" Mach 6 CF4 Tunnel	17,428	$27,586,220
Langley Research Center	644	12' Low Speed Tunnel	3,767	$6,624,391
Langley Research Center	645	20' Vertical Spin Tunnel	14,461	$7,385,933
Langley Research Center	648	Transonic Dynamics Tunnel (TDT)	41,771	$134,476,694
Marshall Space Flight Center	4732	14" Trisonic Wind Tunnel	26,773	$15,864,288
Marshall Space Flight Center	4775	High Reynolds Number Wind Tunnel	3,521	$838,104
Plum Brook Station	3411	Hypersonic Test Facility	6,082	$40,988,331
Total			**1,183,485**	**$2,923,726,964**

[A] Size is the approximate GSFT associated with the wind tunnel from site inspections. GSFT of entire property may exceed inspection sample.
[B] CRV is the Current Replacement Value of the entire property and may exceed the value of the inspected area.

Detailed cost models were developed for the two Wind Tunnels using CBRE | Whitestone's MARS Facility Cost Forecast System.

Description of the MARS Model

CBRE | Whitestone used MARS to estimate preventative maintenance, unscheduled maintenance, repair, and renewal/replacement costs for this project. MARS is an asset management system that estimates both deferred maintenance and future requirements on the basis of asset components and their scheduled maintenance and repair. It also estimates costs for ten operations types in the typical commercial chart of accounts. MARS was originally developed in 1996, and is currently in its eighth version. It is used by many government agencies and commercial concerns.

Note that the definition of future M&R requirements is the same as the "sustainment" requirements used for programming by DoD and an approach endorsed in a National Research Council (NRC) study of Department of Energy facility practices.[2] Among other agencies, the MARS Facility Cost Forecast System has been used to forecast budgets for the IRS, FAA, USDA, and CDC. It was recently used to benchmark costs for the Department of State Overseas Embassies. MARS is also the basis for the DoD Sustainment Model and a study for NNSA validating total life-cycle facility costs at eight nuclear weapons production and research sites.[3] The model is used continuously to simulate alternative facility costs for the U.S. nuclear complex.

The MARS process begins with a component inventory of a building or structure. Derived from building plans, equipment inventory data, and on-site inspections, these components are organized into UNIFORMAT category level three elements and are identified specifically in terms of product characteristics, quantity, and output level; e.g. "Single-Ply Modified

[2] National Research Council, *Intelligent Sustainment and Renewal of Department of Energy Facilities and Infrastructure, 2004*. P. 44.

[3] Jacobs Facilities and Whitestone Research, *Implementation of the Department of Defense Sustainment Model, Final Report*, May 2002.

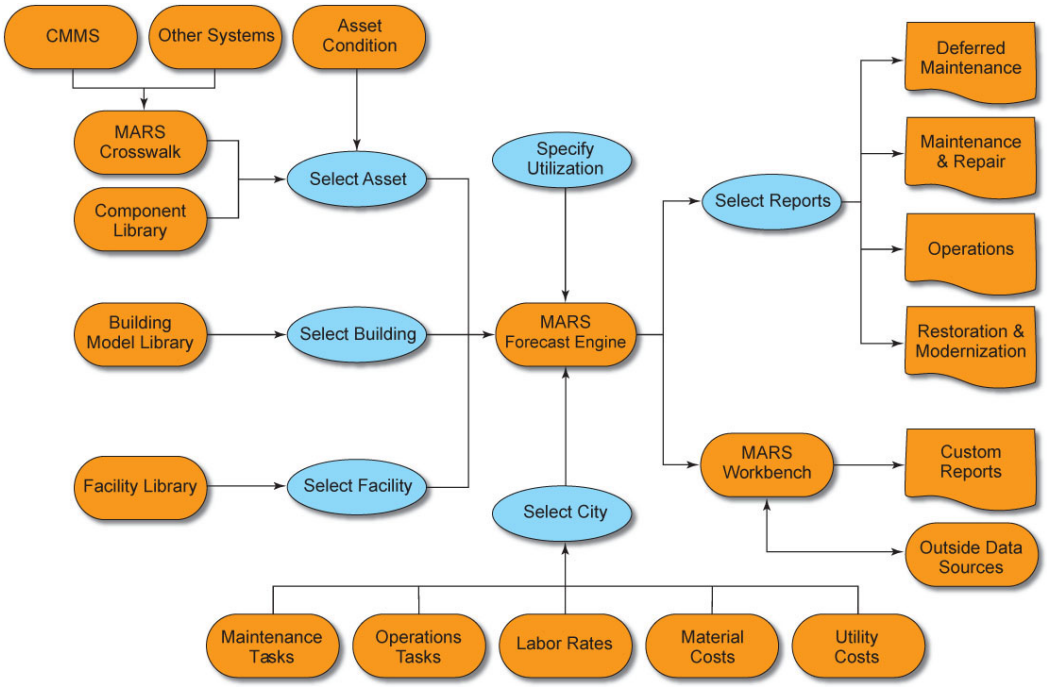
Bituminous/Thermoplastic Roof," "Condenser, Air-Cooled, 60 Ton," or "Pipe & Fittings, ¾" Copper."

Once the component inventory is completed, the MARS system relates maintenance tasks from a pre-defined task library to each selected component. New components and related tasks are defined as necessary. The frequency of each task determines the forecast of future required maintenance. MARS estimates four types of maintenance: preventative maintenance, unscheduled maintenance (service calls), repair, and renewal/replacement tasks. Tasks and their labor and material requirements are pre-defined by CBRE | Whitestone, but are also editable.

Other calibration steps include modifying default values for contract and in-house labor rates, specifying site-typical mark-up for contract expenditures, and identifying the utilization characteristics for each asset.

The sources for local wage rates and benefits are primarily the U.S. Department of Labor and Davis-Bacon Act labor agreements, and private sector employers. Both union and non-union wages are considered in determining prevailing rates by locality. State and local wage surveys are also used when available.

MARS Facility Cost Forecast System



MARS is also used to estimate operations costs other than maintenance and repair. These are based on the Facilities Operation Model developed jointly by the Department of Defense (DOD) and CBRE | Whitestone. This model provides costs for ten services, including those mentioned in the Federal Real Property Council (FRPC) guidance—utilities, cleaning and janitorial, and

roads and grounds.[4] Each operation type for an asset can be calibrated for a level of service (low, medium, high) to reflect the level of demand or frequency at which certain operations task are performed.

The CBRE | Whitestone operations cost models provides estimates for the following services:

Custodial. The custodial function represents the expense of cleaning offices, work areas, restrooms and common areas. Costs include local wage rates and benefits, task productivity, mark-ups for equipment, materials, supervision, and assumptions concerning the level of service. Trash removal costs are not included. Custodial service levels are defined by altering the combination and frequency of common tasks.

Energy. Energy includes all expenses related to the purchase, generation, distribution, and conservation of energy and source fuels necessary to operate an asset. The main energy sources considered are electricity and natural gas. Not included are utilities maintenance and supervision, and utility tax rates. Service levels vary according to estimated commodity demand by asset use type.

Grounds. The grounds function includes any expense related to the maintenance of exterior landscaping. It does not include sweeping or the maintenance of signage, parking lots and roadways. Costs are estimated using local wage rates and benefits, task productivity, mark-ups for equipment, materials and supervision, and assumptions concerning the level of service. Service levels are defined by altering the combination and frequency of common tasks.

Management. The real property management function describes all costs associated with facility management, including: public works, contracts, material procurement, facility data, furnishings, real estate, and engineering services. Costs are expressed as a fixed percentage of Plant Replacement Value. Service levels are based on the distribution of costs found in institutional and commercial settings. For this project, the level of service for all NASA buildings was set to low to reflect economies of scale in a campus environment.

Pest Control. Pest control expenses cover indoor and outdoor pest control programs, separate from the grounds function. Costs are based on the frequency of common tasks for rodent and insect abatement and inspections. Costs include prevailing labor and material rates. Service levels are defined by altering the combination and frequency of common tasks.

Refuse. Refuse costs include all expenses related to trash collection and disposal, pick-up services, fees, recycling operations and administration, composting, etc. Costs exclude handling and disposal of HAZMAT materials. Service levels vary according to estimated demand by asset use type.

Road Clearance. The road clearance function includes all expenses related to sweeping paved areas including sidewalks, walkways, and parking lots. Costs include prevailing labor and material rates, and climatic variables. Service levels are defined by altering the combination and frequency of common tasks.

[4] Federal Real Property Council. *Guidance for Real Property Inventory Reporting.* Washington, D.C. August, 2012.

Security. Security expenses relate to the physical security of assets and occupants, and include personnel, operating and monitoring security equipment. Costs include relevant prevailing labor and material rates. Service levels are defined by altering the combination and frequency of common tasks and services.

Telecommunications. Telecommunication expenses cover the purchase of all the services ordinarily associated with commercial activities, such as voice and data equipment and service subscription. The level of telecommunications is defined by the combination of services selected.

Water and Sewer. Water and Sewer expenses include all costs related to providing the asset with potable water, irrigation water, and sewage service. Estimates include local commodity costs. Service levels vary according to estimated commodity demand by asset use type.

Data Collection and Calibration

MARS Model Development

The technical work for this task involved the definition of the component inventory for the two sample Wind Tunnels. Glenn Research Center staff supplied existing equipment inventories and construction design documents before the inspection. Jacobs Facilities inspected the Wind Tunnels and created draft models in MARS. Due to the unique systems in the Wind Tunnels, Jacobs created 162 unique components in MARS. In total, 867 components were used in the models of the two facilities.

Jacobs submitted the MARS database to CBRE | Whitestone for a detailed component-by-component review. Three areas of focus included:

1) Check for completeness. Review the wall finishes (exterior and interior), roofing, plumbing, HVAC, fire protection, and electrical data to ensure the building model contains the appropriate components in each category.

2) Check for consistency. Review the building gross square feet for accuracy. Ensure the square footage of structural components (exterior walls, roofing system, interior finishes) are reasonable compared to building GSFT. Verify the capacity of the following is consistent with the building type and size:

- Heating, cooling, and air distribution
- Electrical service, distribution, and lighting
- Plumbing fixtures and water distribution
- Fire protection

3) Forecast review. Run the following building-level MARS reports and look for extraordinary costs (high or low) illustrating an error in the building model:

- Average M&R Costs
- Most Costly M&R Tasks

- Deferred Maintenance Detail
- Operation Cost Summary

The sample Wind Tunnel component lists and draft estimates were also provided to NASA staff for review. Any changes were incorporated into this report.

Attachment B and C provide detailed MARS component lists for the two inspected Wind Tunnels at GRC.

CBRE | Whitestone also collected information to calibrate the models for local site values.

Local Calibration of MARS

While the MARS system has pre-defined building models, labor and material costs, utility rates, and an extensive component library, all of these values can be changed or supplemented to reflect the actual site practices.

Calibration data was gathered to adjust MARS factors for maintenance & repair and operations costs of the Wind Tunnels. Data was gathered at both the site and the building level. Site-level information, such as labor and utility rates, was directly used to estimate O&M costs for the Wind Tunnels at GRC. Building-level calibration data was applied to the sample models and then extrapolated to the remaining NASA inventory.

The following data was collected to calibrate the building models:

Maintenance and Repair. A default assumption in MARS assigns in-house labor to preventative maintenance, minor repair, and unscheduled maintenance, while contract labor performs major repair and replacement tasks. NASA staff indicated all maintenance was performed by contract laborers. CBRE | Whitestone adjusted the MARS database accordingly.

NASA personnel specified laborers must be paid prevailing wages for the area. We used the default MARS wage rates for this study, and included a 30 percent mark-up for contract overhead.

Table 3 shows the source of the maintenance and repair factors for each site.

Table 3. Data Sources by Site, Maintenance & Repair

Site	In-house Shop Rates	In-house Markup Rates	Contract Labor Rates	Contract Overhead Rates	Utilization
Glenn Research Center	N/A	N/A	WST	WST	Site

WST=Whitestone, Site = Respective NASA Site

MARS estimates also can be adjusted to reflect utilization factors that impact M&R. For example, many NASA facilities have special safety requirements which increase costs relative to conventional commercial practice. Other special requirements include high or low hours of

operation and security. Glenn Research Center defined utilization factors for the two sample Wind Tunnels.

Table 4 displays the average utilization multipliers for the sample Wind Tunnels used to adjust for these requirements.

Table 4. Average Utilization Adjustment by Site[A]

Site	Hours of Operation[B]	Security[C]	Safety & Permitting[D]	Sum[E]
Goddard Space Flight Center	1.00	1.01	1.07	1.08

[A] Calculated from individual asset multipliers assigned by the sites.
[B] Hours of Operation rates building use on a weekly basis and is defined as follows: 0.80 = 40 hours, 1.00 = 41 to 80 hours, 1.37 = 80+ hours.
[C] Security is defined as follows: 1.00 = free access, 1.01 = contractor training & daily check-in, 1.15 = full contractor accompanyment.
[D] Safety & Permitting is defined as follows: 1.00 = typical commercial & service activity, 1.07 = non-specific laboratory, 1.75 = radiological or life science research, 3.00 = nuclear facility.
[E] In combination the multipliers are additive such that the total multiplier = $1 + \sum(\beta - 1)$ where β = the multiplier value.

Operations. MARS also estimates operations costs for ten services including: custodial, energy, grounds, management, pest control, refuse, road clearance, security, telecommunications, and water & sewer. Key drivers of operations estimates include utility rates, labor rates, and mark-ups, which were collected from GRC staff.

In addition, MARS is populated with default levels of service by operation and building type. The building types in MARS are typical to the commercial environment and do not include Wind Tunnels. CBRE | Whitestone worked with NASA staff to develop unique level of service ratings for the Wind Tunnel facilities. The ratings (low, medium, high, or none) reflect the level of utility demand or frequency of operations tasks in these specialized facilities. The sample Wind Tunnels at GRC were assigned a level of service by site staff.

The unique systems and function of the Wind Tunnels prevent utility consumption from closely aligning with facility size. Extrapolating energy and water & sewer costs based on square footage from the sample to the inventory would not generate accurate estimates. To avoid this type of extrapolation, NASA supplied utility rates for all four sites with Wind Tunnels in the inventory, and utility demand for each specific Wind Tunnel. In addition to the utilities estimated in MARS, NASA also provided utility rates and demand for several other types, including process cooling water, chilled water, high pressure air, service air, steam, and altitude exhaust. CBRE | Whitestone calculated total utility costs by multiplying the site rate by each Wind Tunnel's average consumption.

Other utility rates, such as refuse, provided in Phase 1 and 2 were significantly lower than the default MARS commercial rates. These discounts are often provided to large federal property holders like NASA. CBRE | Whitestone applied the average discounts for the previously calibrated sites to the remaining sites in the Wind Tunnel inventory.

As with M&R, CBRE | Whitestone used the default MARS wage rates and a 30 percent mark-up for contract overhead.

Table 5 shows the source of the operations calibration data.

Table 5. Data Sources by Site, Operations

Site	Source
Level of Service	GRC
Custodial Wage	CBRE | Whitestone
Groundskeeper Wage	CBRE | Whitestone
Property Management	GRC
Pest Control Wage	CBRE | Whitestone
Refuse Rates	CBRE | Whitestone
Road Clearance Wage	CBRE | Whitestone
Security Rates	CBRE | Whitestone
Telecom Rates	CBRE | Whitestone
Water/Sewer	ARC / GRC / LaRC / MSFC
Building Electricity	ARC / GRC / LaRC / MSFC
Tunnel Electricity	ARC / GRC / LaRC / MSFC
Natural Gas	ARC / GRC / LaRC
Steam	ARC / GRC / LaRC / MSFC
Process Cooling Water	ARC / GRC / LaRC
6,000 PSIG Air	LaRC
450 PSIG Air	GRC
Service Air	GRC
Building 64 Altitude Exhaust	GRC
Building 114 Altitude Exhaust	GRC
IRT Chiller Plant	GRC

Inventory Mapping and Extrapolation

There are a number of variables that drive O&M costs. In Phase 1 and 2 of the project, building Classification type and size were the key inputs used to determine appropriate mapping of sample facilities to the total inventory. Per square foot estimates were generated for the sample and extrapolated to the selected inventory by type (Administration, Propulsion, Communications, and Space Science (R&D and Test) Buildings) and size.

The unique systems and function of the Wind Tunnels prevent O&M costs from closely aligning with facility square footage. NASA and CBRE | Whitestone defined several variables and associated factors used to map the sample models and extrapolate total O&M costs to the remainder of the inventory.

Table 6 shows six variables that will be used to estimate the cost requirements of NASA Wind Tunnels.

Table 6. Inventory Mapping and Extrapolation Variables

Variable[A]	Description
Flow Velocity Category	Subsonic, Transonic, Supersonic, or Hypersonic. Used to determine mapping and extrapolation factor.
Mach Number	Used to determine mapping and extrapolation factor.
Operation Type	Continuous flow or blow-down. Used to determine mapping.
Closed or Open Tunnel	Closed-loop or open exhaust tunnel. Used to determine mapping.
Test Cell Cross Section Area	Used to determine extrapolation factor.
Auxiliary Equipment	Auxiliary cooling water, nozzle type, drying, and drive motor equipment. Used to determine extrapolation factor.

[A] Variables and extrapolation factors were defined by NASA through research, evaluating maintenance schedules, and historical knowledge of the Wind Tunnel facilities and their operating costs.

While all variables were considered in the mapping effort, air speed (flow velocity and mach number) and operation type (continuous flow or blow-down) were the key variables used to map the two inspected Wind Tunnels to the inventory. Continuous flow sub/trans/supersonic Tunnels were mapped to the 9'x15' Low Speed / 8'x6' Supersonic Wind Tunnel. These tunnels operate for an extended period of time and require special equipment, including large drive motors, to continuously supply air down the tunnel. All blow-down tunnels were mapped to the 1'x1' Supersonic Wind Tunnel. These tunnels blow a single volume of air down the tunnel and do not operate continuously.

After the sample models were mapped to the inventory, the project team identified the key variables that were used to adjust the sample O&M costs to make them more appropriate for the remaining Wind Tunnels. These variables included air speed (flow velocity and mach number), test cell cross section area, and auxiliary equipment requirements (process cooling water, chiller water, drive motors, integral air dryers, compressors, electrolyte system, and flexwall system). Each variable included a factor to increase or decrease costs relative to the sample models. These factors were developed through research with NASA staff and provided by Pete Aitcheson.

The extrapolation factors were used to estimate O&M costs for each Wind Tunnel in the inventory to which they apply. The continuous flow Tunnels mapped to the 9'x15' Low Speed / 8'x6' Supersonic Wind Tunnel share similar features and all of the variables were applicable. However, only the test cell cross section area was used to determine the O&M costs of the Tunnels mapped to the 1'x1' Supersonic Wind Tunnel.

Table 7 shows the selected Wind Tunnel inventory by site and the sample model mapping assignment and extrapolation factors.

Table 7. Inventory Mapping and Extrapolation Factors

Site	Property No.	Flow Velocity	Mach Number	Test Cell Area	Operation Type	Closed/Open	Sample Model	Extrapolation Factor
ARC	N206/N206A	Subsonic	0 to .55	11.25' X 11.25'	Continuous	Closed	9' X 15'	0.64
ARC	N215	Subsonic	0 to .33	7' X 10'	Continuous	Closed	9' X 15'	0.47
ARC	N221/N221B	Subsonic	0 to .45, 0 to .15	39' X 79', 79' X 118.3'	Continuous	Closed/Open	9' X 15'	4.61
ARC	N227A/N227B/N227C	Trans/Supersonic	0.4 to 1.4, 1.55 to 2.5, 2.45 to 3.5	11' X 11', 9' X 7', 8' X 7'	Continuous	Closed	9' X 15'	1.00
GRC	11/170	Subsonic	0.0 to .50	6' X 9'	Continuous	Closed	9' X 15'	0.52
GRC	37	Supersonic	1.6 to 5.0	1' X 1'	Continuous	Closed	N/A	1.00
GRC	39/53/54/57/61	Sub/Trans/Supersonic	0 to .2 & .4 to 2.0	9' X 15'/8' X 6'	Continuous	Closed/Open	N/A	1.00
GRC	85/87/88/90/113/114	Supersonic	2.0 to 3.5	10' X 10'	Continuous	Closed/Open	9' X 15'	1.99
LaRC	1212C	Subsonic	0 to .3	14.5' X 21.75'	Continuous	Closed/Open	9' X 15'	1.00
LaRC	1236	Transonic	.1 to 1.2	8.2' X 8.2'	Continuous	Closed	9' X 15'	0.48
LaRC	1242	Sub/Transonic	0.1 to .9	13" X 13"	Continuous	Closed	9' X 15'	0.06
LaRC	1247D	Hypersonic	6	20" X 20.5"	Blow down	Closed/Open	1' X 1"	1.69
LaRC	1251	Supersonic	1.46 to 2.86 & 2.3 to 4.63	4' X 4'	Continuous	Closed	9' X 15'	0.66
LaRC	1251A-15"	Hypersonic	6	14.5" Dia.	Blow down	Closed	1' X 1"	1.07
LaRC	1251A-31"	Hypersonic	10	31" X 31"	Blow down	Closed	1' X 1"	2.58
LaRC	1265	Hypersonic	3, 4, 5, & 7	8' Dia.	Blow down	Open	1' X 1"	7.07
LaRC	1275	Hypersonic	6	20" Dia.	Blow down	Closed	1' X 1"	1.48
LaRC	644	Subsonic	0 to 61 MPH	12' Octagon	Continuous	Open	9' X 15'	0.02
LaRC	645	Subsonic	0 to .08	20' Dia.	Continuous	Closed	9' X 15'	0.12
LaRC	648	Transonic	0 to 1.12	16' X 16'	Continuous	Closed	9' X 15'	0.94
MSFC	4732	Sub/Trans/Supersonic	.2 to 3.5	14" X 14"	Blow down	Closed	1' X 1"	1.17
MSFC	4775	Supersonic	.3 to 3.5	32" Dia.	Blow down	Closed	1' X 1"	2.36
PBS	3411	Hypersonic	5, 6, & 7	42" Dia.	Blow down	Closed	1' X 1"	3.10

A detailed summary of the methodology and calculations used to determine the Wind Tunnel utility costs, inventory mapping, and extrapolation factors was provided by Pete Aitcheson, NASA HQ Operations and Maintenance Program Manager. This summary can be found in Attachment A of this report.

Cost Estimates for Wind Tunnels

Sustainment Costs

The sustainment estimate for the 9'x15' Low Speed / 8'x6' Supersonic Wind Tunnel (Property No. 39/53/54/57/61) is an average of $1.2 million per year over a 50-year period. The 1'x1' Supersonic Wind Tunnel (Property No. 37) is $167 thousand over the same period.

The sample estimates were extrapolated to the population. Table 8 shows sustainment costs by site for all Wind Tunnels. Sustainment estimates are expressed as 30, 40, and 50-year averages. While CBRE | Whitestone computes annual requirements, average costs are presented to smooth the annual oscillations. Overall, the sustainment requirements are an average of $20.9 million per year over 50 years. Expressed another way, this amounts to 0.7 percent of the $2.9 billion replacement value.

Table 8. Average Annual Estimates of Sustainment Requirements by Site, Wind Tunnels

				Sustainment[A]								
				30-Year Estimates			40-Year Estimates			50-Year Estimates		
Site	Property No.	GSFT[B]	CRV[C]	Avg. Annual Estimate	Per GSFT	Percent CRV	Avg. Annual Estimate	Per GSFT	Percent CRV	Avg. Annual Estimate	Per GSFT	Percent CRV
ARC	N206/N206A	36,364	$253,246,932	$980,441	$26.96	0.4%	$1,020,883	$28.07	0.4%	$975,942	$26.84	0.4%
ARC	N215	28,763	$36,488,779	$720,011	$25.03	2.0%	$749,711	$26.07	2.1%	$716,707	$24.92	2.0%
ARC	N221/N221B	171,129	$529,305,708	$7,062,237	$41.27	1.3%	$7,353,545	$42.97	1.4%	$7,029,829	$41.08	1.3%
ARC	N227A/N227B/N227C	53,580	$322,857,273	$1,531,939	$28.59	0.5%	$1,595,129	$29.77	0.5%	$1,524,909	$28.46	0.5%
GRC	11/170	32,501	$60,139,291	$627,642	$19.31	1.0%	$653,531	$20.11	1.1%	$624,761	$19.22	1.0%
GRC	37	7,479	$6,608,331	$169,293	$22.64	2.6%	$164,256	$21.96	2.5%	$167,314	$22.37	2.5%
GRC	39/53/54/57/61	119,514	$106,691,109	$1,207,003	$10.10	1.1%	$1,256,790	$10.52	1.2%	$1,201,464	$10.05	1.1%
GRC	85/87/88/90/113/114	170,941	$297,274,694	$2,401,936	$14.05	0.8%	$2,501,013	$14.63	0.8%	$2,390,914	$13.99	0.8%
LaRC	1212C	51,354	$90,413,562	$998,375	$19.44	1.1%	$1,039,557	$20.24	1.1%	$993,794	$19.35	1.1%
LaRC	1236	79,745	$393,554,794	$479,220	$6.01	0.1%	$498,987	$6.26	0.1%	$477,021	$5.98	0.1%
LaRC	1242	9,276	$13,304,480	$59,903	$6.46	0.5%	$62,373	$6.72	0.5%	$59,628	$6.43	0.4%
LaRC	1247D	100,360	$141,019,520	$236,653	$2.36	0.2%	$229,611	$2.29	0.2%	$233,886	$2.33	0.2%
LaRC	1251	134,535	$308,493,730	$658,928	$4.90	0.2%	$686,108	$5.10	0.2%	$655,904	$4.88	0.2%
LaRC	1251A-15"	24,312	$3,161,438	$149,834	$6.16	4.7%	$145,375	$5.98	4.6%	$148,082	$6.09	4.7%
LaRC	1251A-31"	24,312	$3,161,438	$361,281	$14.86	11.4%	$350,531	$14.42	11.1%	$357,057	$14.69	11.3%
LaRC	1265	25,517	$124,241,924	$990,022	$38.80	0.8%	$960,562	$37.64	0.8%	$978,447	$38.34	0.8%
LaRC	1275	17,428	$27,586,220	$207,246	$11.89	0.8%	$201,080	$11.54	0.7%	$204,823	$11.75	0.7%
LaRC	644	3,767	$6,624,391	$19,968	$5.30	0.3%	$20,791	$5.52	0.3%	$19,876	$5.28	0.3%
LaRC	645	14,461	$7,385,933	$119,805	$8.28	1.6%	$124,747	$8.63	1.7%	$119,255	$8.25	1.6%
LaRC	648	41,771	$134,476,694	$938,473	$22.47	0.7%	$977,184	$23.39	0.7%	$934,166	$22.36	0.7%
MSFC	4732	26,773	$15,864,288	$179,683	$6.71	1.1%	$174,337	$6.51	1.1%	$177,583	$6.63	1.1%
MSFC	4775	3,521	$838,104	$362,438	$102.94	43.2%	$351,654	$99.87	42.0%	$358,201	$101.73	42.7%
PBS	3411	6,082	$40,988,331	$524,809	$86.29	1.3%	$509,193	$83.72	1.2%	$518,674	$85.28	1.3%
Total[D]		**1,183,485**	**$2,923,726,964**	**$20,987,140**	**$17.73**	**0.7%**	**$21,626,946**	**$18.27**	**0.7%**	**$20,868,238**	**$17.63**	**0.7%**

[A] Sustainment is the average annual sum of preventative maintenance, unscheduled maintenance, and major repair and replacement tasks.
[B] Size is the approximate GSFT associated with the wind tunnel from site inspections. GSFT of entire property may exceed inspection sample.
[C] CRV is the Current Replacement Value of the entire property and may exceed the value of the inspected area.
[D] All costs expressed in $2012.

Operations Costs

Estimates of twenty operations costs are shown in Table 9 and 10. Costs were broken out into two tables, the typical MARS chart of accounts and the unique utilities associated with NASA Wind Tunnels. In total, the CBRE | Whitestone operations requirements for the selected Wind Tunnels are an annual average of $10.1 million, or 0.3 percent of replacement value. Note that in commercial accounting M&R (sustainment) is often included as an operating cost, but is reported separately above.

Table 9 shows costs for nine operations types included in MARS.

Table 9. Annual Estimates of CBRE | Whitestone Operations Costs by Site, Wind Tunnels

				CBRE | Whitestone Operations Types[A]											
Site	Property No.	GSFT[B]	CRV[C]	Custodial	Grounds	Management	Pest Control	Refuse	Road Clearance	Security	Telecom	Water/ Sewer[D]	Total Costs	Per GSFT	Percent CRV
ARC	N206/N206A	36,364	$253,246,932	$4,541	$12,533	$633,117	$5,407	$603	$0	$28,413	$27,670	$0	$712,284	$19.59	0.3%
ARC	N215	28,763	$36,488,779	$3,592	$9,913	$91,222	$4,277	$477	$0	$22,474	$21,886	$0	$153,841	$5.35	0.4%
ARC	N221/N221B	171,129	$529,305,708	$21,371	$58,981	$1,323,264	$25,444	$2,838	$0	$133,712	$130,215	$0	$1,695,824	$9.91	0.3%
ARC	N227A/N227B/N227C	53,580	$322,857,273	$6,691	$18,467	$807,143	$7,966	$889	$0	$41,865	$40,770	$0	$923,790	$17.24	0.3%
GRC	11/170	32,501	$60,139,291	$3,541	$6,817	$150,348	$2,555	$129	$2,603	$24,796	$24,730	$4,535	$220,054	$6.77	0.4%
GRC	37	7,479	$6,608,331	$713	$1,572	$16,521	$589	$30	$599	$12,761	$7,203	$17,106	$57,094	$7.63	0.9%
GRC	39/53/54/57/61	119,514	$106,691,109	$13,020	$25,066	$266,728	$9,396	$347	$9,548	$91,180	$90,940	$56,994	$563,219	$4.71	0.5%
GRC	85/87/88/90/113/114	170,941	$297,274,694	$18,623	$35,852	$743,187	$13,439	$680	$13,691	$130,415	$130,072	$82,592	$1,168,549	$6.84	0.4%
LaRC	1212C	51,354	$90,413,562	$4,888	$11,129	$226,034	$5,304	$732	$312	$38,609	$39,076	$0	$326,083	$6.35	0.4%
LaRC	1236	79,745	$393,554,794	$7,591	$17,282	$983,887	$8,236	$1,136	$484	$59,953	$60,679	$0	$1,139,248	$14.29	0.3%
LaRC	1242	9,276	$13,304,480	$883	$2,010	$33,261	$958	$132	$56	$6,974	$7,058	$0	$51,333	$5.53	0.4%
LaRC	1247D	100,360	$141,019,520	$8,360	$21,797	$352,549	$10,382	$1,430	$609	$168,745	$96,656	$0	$660,528	$6.58	0.5%
LaRC	1251	134,535	$308,493,730	$12,806	$29,156	$771,234	$13,894	$1,917	$817	$101,145	$102,370	$0	$1,033,338	$7.68	0.3%
LaRC	1251A-15"	24,312	$3,161,438	$2,025	$5,280	$7,904	$2,515	$346	$148	$40,878	$23,415	$0	$82,511	$3.39	2.6%
LaRC	1251A-31"	24,312	$3,161,438	$2,025	$5,280	$7,904	$2,515	$346	$148	$40,878	$23,415	$0	$82,511	$3.39	2.6%
LaRC	1265	25,517	$124,241,924	$2,125	$5,542	$310,605	$2,640	$364	$155	$42,904	$24,575	$0	$388,910	$15.24	0.3%
LaRC	1275	17,428	$27,586,220	$1,452	$3,785	$68,966	$1,803	$248	$106	$29,303	$16,785	$0	$122,448	$7.03	0.4%
LaRC	644	3,767	$6,624,391	$359	$816	$16,561	$389	$54	$23	$2,832	$2,866	$0	$23,900	$6.34	0.4%
LaRC	645	14,461	$7,385,933	$1,376	$3,134	$18,465	$1,493	$206	$88	$10,872	$11,004	$0	$46,638	$3.23	0.6%
LaRC	648	41,771	$134,476,694	$3,976	$9,052	$336,192	$4,314	$595	$254	$31,404	$31,784	$0	$417,571	$10.00	0.3%
MSFC	4732	26,773	$15,864,288	$2,224	$6,635	$39,661	$1,790	$406	$61	$46,335	$25,785	$0	$122,896	$4.59	0.8%
MSFC	4775	3,521	$838,104	$292	$873	$2,095	$235	$53	$8	$6,094	$3,391	$0	$13,042	$3.70	1.6%
PBS	3411	6,082	$40,988,331	$580	$1,278	$102,471	$479	$24	$487	$10,377	$5,858	$0	$121,554	$19.99	0.3%
Total[E]		**1,183,485**	**$2,923,726,964**	**$123,054**	**$292,250**	**$7,309,317**	**$126,020**	**$13,983**	**$30,196**	**$1,122,917**	**$948,203**	**$161,227**	**$10,127,166**	**$8.56**	**0.3%**

[A] CBRE | Whitestone operations include custodial, pest control, trash collection, utilities (water and sewer), grounds (landscape care, mowing, and snow removal), security, telecommunications, and management.
[B] Size is the approximate GSFT associated with the wind tunnel from site inspections. GSFT of entire property may exceed inspection sample.
[C] CRV is the Current Replacement Value of the entire property and may exceed the value of the inspected area.
[D] Water / Sewer use was not available at the building level at ARC, LaRC, or MSFC.
[E] All costs expressed in $2012.

Operations requirements for the unique NASA Wind Tunnel utility types are displayed in Table 10. In total, the operations costs are an annual average of $21.2 million, or 0.7 percent of replacement value.

Table 10 shows costs for the 11 unique Wind Tunnels utilities.

Table 10. Annual Estimates of NASA Operations Costs by Site, Wind Tunnels

				NASA Operations Types[A]												
Site	Property No.	GSFT[B]	CRV[C]	Building Electricity	Tunnel Electricity	Natural Gas	Steam	Process Cooling Water	6000 PSIG Air	450 PSIG Air	Service Air	Bldg. 64 Altitude Exh.	Bldg. 114 Altitude Exh.	IRT Chiller Plant	Total Costs	Per GSFT	Percent CRV
ARC	N206/N206A	36,364	$253,246,932	$79,419	$118,977	$49,543	$0	$0	$0	$0	$0	$0	$0	$0	$247,939	$6.82	0.1%
ARC	N215	28,763	$36,488,779	$45,963	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$45,963	$1.60	0.1%
ARC	N221/N221B	171,129	$529,305,708	$150,008	$2,141,451	$50,830	$0	$0	$0	$0	$0	$0	$0	$0	$2,342,289	$13.69	0.4%
ARC	N227A/N227B/N227C	53,580	$322,857,273	$2,365,858	$0	$4,432	$0	$232,493	$0	$0	$0	$0	$0	$0	$2,602,783	$48.58	0.8%
GRC	11/170	32,501	$60,139,291	$27,240	$94,637	$0	$139,780	$0	$0	$0	$68,342	$0	$0	$26,789	$356,789	$10.98	0.6%
GRC	37	7,479	$6,608,331	$3,670	$0	$0	$28,265	$178	$0	$1,011,456	$0	$7,488	$0	$0	$1,051,058	$140.53	15.9%
GRC	39/53/54/57/61	119,514	$106,691,109	$26,526	$2,083,200	$146,830	$440,812	$684,370	$0	$1,137,888	$0	$179,712	$0	$0	$4,699,338	$39.32	4.4%
GRC	85/87/88/90/113/114	170,941	$297,274,694	$235,459	$1,438,400	$61,182	$606,300	$277,117	$0	$0	$28,476	$0	$572,688	$0	$3,219,622	$18.83	1.1%
LaRC	1212C	51,354	$90,413,562	$145,562	$204,868	$0	$117,802	$0	$36,724	$0	$0	$0	$0	$0	$504,956	$9.83	0.6%
LaRC	1236	79,745	$393,554,794	$456,373	$830,277	$0	$207,486	$37,047	$237,635	$0	$0	$0	$0	$0	$1,768,818	$22.18	0.4%
LaRC	1242	9,276	$13,304,480	$8,321	$14,221	$0	$21,274	$0	$0	$0	$0	$0	$0	$0	$43,816	$4.72	0.3%
LaRC	1247D	100,360	$141,019,520	$117,617	$0	$0	$296,854	$8,518	$4,505	$0	$0	$0	$0	$0	$427,496	$4.26	0.3%
LaRC	1251	134,535	$308,493,730	$292,491	$569,022	$0	$338,503	$89,442	$13,372	$0	$0	$0	$0	$0	$1,302,830	$9.68	0.4%
LaRC	1251A-15"	24,312	$3,161,438	$117,617	$0	$0	$296,854	$8,518	$7,299	$0	$0	$0	$0	$0	$430,290	$17.70	13.6%
LaRC	1251A-31"	24,312	$3,161,438	$117,617	$0	$0	$296,854	$8,518	$1,711	$0	$0	$0	$0	$0	$424,702	$17.47	13.4%
LaRC	1265	25,517	$124,241,924	$53,282	$0	$24,452	$84,638	$0	$112,771	$0	$0	$0	$0	$0	$275,142	$10.78	0.2%
LaRC	1275	17,428	$27,586,220	$11,861	$0	$13,332	$0	$0	$0	$0	$0	$0	$0	$0	$25,193	$1.45	0.1%
LaRC	644	3,767	$6,624,391	$13,103	$0	$5,855	$0	$0	$0	$0	$0	$0	$0	$0	$18,958	$5.03	0.3%
LaRC	645	14,461	$7,385,933	$13,103	$0	$22,485	$0	$0	$0	$0	$0	$0	$0	$0	$35,588	$2.46	0.5%
LaRC	648	41,771	$134,476,694	$218,965	$768,177	$71,224	$0	$36,300	$84,439	$0	$0	$0	$0	$0	$1,179,104	$28.23	0.9%
MSFC	4732	26,773	$15,864,288	$28,898	$0	$0	$9,122	$0	$1,711	$0	$0	$0	$0	$0	$39,731	$1.48	0.3%
MSFC	4775	3,521	$838,104	$2,331	$0	$0	$1,200	$0	$7,299	$0	$0	$0	$0	$0	$10,831	$3.08	1.3%
PBS	3411	6,082	$40,988,331	$75,888	$0	$8,692	$0	$0	$13,403	$0	$0	$0	$0	$0	$97,983	$16.11	0.2%
Total[D]		**1,183,485**	**$2,923,726,964**	**$4,607,174**	**$8,263,230**	**$458,856**	**$2,885,745**	**$1,382,503**	**$520,872**	**$2,149,344**	**$96,818**	**$187,200**	**$572,688**	**$26,789**	**$21,151,218**	**$17.87**	**0.7%**

[A] NASA Operations include utilities (electricity, natural gas, and steam), process cooling water, chiller water, high pressure air, service air, and altitude exhaust.
[B] Size is the approximate GSFT associated with the wind tunnel from site inspections. GSFT of entire property may exceed inspection sample.
[C] CRV is the Current Replacement Value of the entire property and may exceed the value of the inspected area.
[D] All costs expressed in $2012.

Overall, the total operations requirements for the selected Wind Tunnels inventory are an average annual $31.3 million, or 1.1 percent of replacement value.

Total O&M Costs

Estimated total annual Wind Tunnels costs are shown in Table 11. A combination of maintenance and repair (sustainment) and operations, these costs represent an annual average for the next 50 years. Total costs are an estimated $52.1 million per year, or 1.8 percent of replacement value.

Table 11. Total Annual Costs by Site, Wind Tunnels

Site	Property No.	GSFT[A]	CRV[B]	O&M Estimates: 50-Year Avg. Sustainment[C]	O&M Estimates: Annual Operations[D]	Total Costs	Per GSFT	Percent CRV
ARC	N206/N206A	36,364	$253,246,932	$975,942	$960,223	$1,936,164	$53.24	0.8%
ARC	N215	28,763	$36,488,779	$716,707	$199,804	$916,511	$31.86	2.5%
ARC	N221/N221B	171,129	$529,305,708	$7,029,829	$4,038,113	$11,067,942	$64.68	2.1%
ARC	N227A/N227B/N227C	53,580	$322,857,273	$1,524,909	$3,526,574	$5,051,482	$94.28	1.6%
GRC	11/170	32,501	$60,139,291	$624,761	$576,843	$1,201,604	$36.97	2.0%
GRC	37	7,479	$6,608,331	$167,314	$1,108,152	$1,275,466	$170.54	19.3%
GRC	39/53/54/57/61	119,514	$106,691,109	$1,201,464	$5,262,556	$6,464,021	$54.09	6.1%
GRC	85/87/88/90/113/114	170,941	$297,274,694	$2,390,914	$4,388,171	$6,779,085	$39.66	2.3%
LaRC	1212C	51,354	$90,413,562	$993,794	$831,039	$1,824,833	$35.53	2.0%
LaRC	1236	79,745	$393,554,794	$477,021	$2,908,066	$3,385,087	$42.45	0.9%
LaRC	1242	9,276	$13,304,480	$59,628	$95,149	$154,777	$16.69	1.2%
LaRC	1247D	100,360	$141,019,520	$233,886	$1,088,023	$1,321,910	$13.17	0.9%
LaRC	1251	134,535	$308,493,730	$655,904	$2,336,169	$2,992,073	$22.24	1.0%
LaRC	1251A-15"	24,312	$3,161,438	$148,082	$512,800	$660,882	$27.18	20.9%
LaRC	1251A-31"	24,312	$3,161,438	$357,057	$507,212	$864,270	$35.55	27.3%
LaRC	1265	25,517	$124,241,924	$978,447	$664,052	$1,642,499	$64.37	1.3%
LaRC	1275	17,428	$27,586,220	$204,823	$147,640	$352,464	$20.22	1.3%
LaRC	644	3,767	$6,624,391	$19,876	$42,858	$62,734	$16.65	0.9%
LaRC	645	14,461	$7,385,933	$119,255	$82,226	$201,481	$13.93	2.7%
LaRC	648	41,771	$134,476,694	$934,166	$1,596,675	$2,530,841	$60.59	1.9%
MSFC	4732	26,773	$15,864,288	$177,583	$162,627	$340,210	$12.71	2.1%
MSFC	4775	3,521	$838,104	$358,201	$23,872	$382,073	$108.51	45.6%
PBS	3411	6,082	$40,988,331	$518,674	$219,537	$738,211	$121.38	1.8%
Total[E]		**1,183,485**	**$2,923,726,964**	**$20,868,238**	**$31,278,384**	**$52,146,622**	**$44.06**	**1.8%**

[A] Size is the approximate GSFT associated with the wind tunnel from site inspections. GSFT of entire property may exceed inspection sample.

[B] CRV is the Current Replacement Value of the entire property and may exceed the value of the inspected area.

[C] Sustainment is the average annual sum of preventative maintenance, unscheduled maintenance, and major repair and replacement tasks.

[D] Operations include CBRE | Whitestone operations and NASA operations types.

[E] All costs expressed in $2012.

Included in Attachment B and C are detailed MARS reports for the two sample Glenn Research Center Wind Tunnels.

Attachment A: Detailed Wind Tunnels Research Summary

Wind Tunnel O & M Cost Analysis for Model Input

Provided by
Pete Aitcheson, NASA HQ Operations and Maintenance Program Manager

Wind Tunnel Data

As expected with any large organization, there are a number of data sources for wind tunnels and not all the data matches. Outside of visiting and analyzing every wind tunnel in the agency, which was cost prohibitive, a variety of other sources were used to determine which wind tunnels would be modeled in this project. These include:

1. The Aeronautics Test Program (ATP) was most helpful, particularly in determining which tunnels should be modeled and for providing an updated list of demolished wind tunnels. Their website was also useful to verify the wind tunnel characteristics which were used to help develop the extrapolation factors for the maintenance costs.
2. The SCAP program provided valuable information.
3. A table from Mr. Lee's manuscript on NASA Wind Tunnels.
4. The NASA Technical Facilities Catalog and the Aeronautical Facilities Catalog were also used to understand characteristics and configurations.
5. Real Property Management System (RPMS) was used for building level data.
6. Several NASA Wind Tunnel technical reports were used when more detailed information was required.
7. Discussions with on-site personnel to confirm various on-site conditions.

All the information gathered was summarized in a spreadsheet which listed:

1. Facility Number
2. Facility Size (in gross square feet)
3. Status (Active or inactive)
4. Mach Number
5. Reynolds Number
6. Flow Velocity Category (subsonic, transonic, supersonic or hypersonic)
7. Test Cell Cross Sectional Area
8. Operation (continuous or blow-down, open or closed loop)
9. Use Activity (high, medium or low)
10. Detailed Model (no for all except the 1 X 1 and the 8 X 6/9 X 15)
11. Extrapolate to 1 X 1 or the 8 X 6/9 X 15
12. Extrapolation Factor (based on test cell size flow velocity in the tunnel and configuration)
13. Notes – The notes section provides characteristics specific to each tunnel.

The spreadsheet is divided into 3 blocks:

1. Active Wind Tunnels – these are currently being used for testing at some level.
2. Inactive Wind Tunnels – these are mothballed, but could be reopened and used if a program desired to test at these conditions. For purposes of the cost study, these tunnels were modeled and medium use was assumed.

3. Propulsion Tunnels – these were not modeled, because the type of equipment and configuration appeared to deviate too far from the typical wind tunnel configuration. Arc heated, ballistic and shock facilities were also not modeled in this study.

Tunnels with multiple test cells were modeled as one tunnel since they shared common equipment.

Extrapolation of Maintenance Costs

Maintenance costs for more common types of facilities such as office buildings or warehouses can be extrapolated to different size facilities of the same type fairly accurately on a square foot basis. The floor area of a wind tunnel has very little relevance when it comes to determining maintenance costs. Instead, the maintenance cost for a wind tunnel are more closely related to the to the power requirements of the tunnel which are in part determined by the wind speed (velocity) in the tunnel, test cell size (volume). The configuration also impacts maintenance costs such as blow down verses continuous operation (time). The following criteria were used for the initial extrapolation:

1. For subsonic and transonic continuous operation type tunnels the extrapolation was based on the 9 X 15 test section.
2. For supersonic continuous operation type tunnels the extrapolation was based on the 8 X 6 test section.
3. All blow down tunnels were extrapolated to the 1 X 1 (1NW) Wind Tunnel.

In addition, LaRC has two vertically configured tunnels; the 20 foot Vertical Spin Tunnel (VST) and the 12 Foot Low Speed Tunnel (LST). Because of their vertical configuration, they have a much smaller footprint, so the extrapolation factor was adjusted by the ratio of the area vertical tunnel to the area of the 9 X 15.

Additional features of the continuous operation type wind tunnels also impact O & M costs. The following features were also taken into account to modify the extrapolation factor in addition to 1 through 3 listed above:

1. Process cooling water requirements
2. Number of drive motors
3. Auxiliary chiller plant (IRT only)
4. Integral air dryers
5. Compressors
6. Electrolyte systems
7. Flex wall or sliding block nozzle (continuously variable)

There are other features that could be taken into account, but it was determined the remaining features either had a lower impact on overall O & M costs for most of the wind tunnels in the agency, the feature was unique to one or two facilities or modeling was more appropriate for another type of facility other than a wind tunnel. Note that most wind tunnels used an outside source of air (ie. from a plant located outside of the tunnel complex), in those cases the air was treated as a utility which is why it is not factored in at this point. The factors for each of the features used to adjust the extrapolation factor were derived from the 8 X 6/9 X 15 annual

maintenance labor hours. For example, process cooling in the 8 X 6/9 X 15 consumed 6% of the total annual maintenance hours so the process cooling maintenance factor was determined to be 1.06. Below provides more detail about the maintenance factors:

1. Process cooling water requirements – If the tunnel did not use process cooling the extrapolation factor was divided by 1.06, since 6% of the total annual labor hours on the 8 X 6/9 X 15 were used to service the process cooling related components.
2. Number of drive motors – since the 8 X 6/9 X 15 has three drive motors, two motor maintenance factors were used; one factor for one drive motor and one factor for 6 or more drive motors (it was assumed having 2-4 motors was considered minimally different from 3 motors). None of the wind tunnels examined had 5 drive motors. The one motor maintenance factor is a 9% decrease in overall wind tunnel maintenance costs and the 6 plus motor maintenance factor increases overall maintenance costs by 38%.
3. Auxiliary chiller plant (IRT only) – Because the IRT relies exclusively on the IRT Chiller Plant for testing, the chiller plant maintenance was included in the IRT Extrapolation Factor. This factor was derived by dividing the Building 170 maintenance costs by an hourly rate to arrive at the annual labor hours. The percentage increase was calculated like all the other factors by dividing the chiller plant maintenance hours by the total annual maintenance hours of the 8 X 6/9 X 15 since this wind tunnel was used as the baseline. Note the energy use by the IRT Chiller Plant is taken into account in the cost of chilled water, not in the maintenance factor.
4. Air dryer - If the tunnel did not use an air dryer integral to the tunnel, the extrapolation factor was divided by 1.15, since 15% of the total annual labor hours on the 8 X 6/9 X 15 were used to service the dryer building components (Building 57).
5. Compressors - Compressors tend to be more maintenance intensive than fans. If a tunnel was equipped with a fan, the maintenance requirements were reduced by 8% (the extrapolation factor was divided by 1.08).
6. Electrolyte system - The 8 X 6/9 X 15 and the 10 X 10 use a large variable resistor system that is submerged in an electrolyte that is more maintenance intensive than an electronic variable speed drive or viable pitch fans. If a tunnel did not have this type of variable speed control, the maintenance requirements were reduced by 9% (the extrapolation factor was divided by 1.09).
7. Flex Wall or Sliding Block Nozzle – Wind tunnels equipped with continuously variable flex wall nozzles or sliding block nozzles are more maintenance intensive than those equipped with a fixed nozzle. Maintenance requirements for fixed nozzle tunnels where reduced by 5% (the extrapolation factor was divided by 1.05).

The formula used for extrapolating the *subsonic and transonic* wind tunnel maintenance costs to the 9 X 15 is as follows:

$$EF = \frac{\left(\frac{T}{T_{9x15}}\right)^{1/2} \times [1 + (C_1 + C_5)]}{[1 + (C_2 + C_3 + C_4 + C_6 + C_7 + C_8)]}$$

The formula used for extrapolating the *supersonic* wind tunnel maintenance costs to the 8 X 6 is as follows:

$$EF = \frac{\left(\frac{T}{T_{8x6}}\right)^{1/2} \times (1 + C_5)}{[1 + (C_2 + C_3 + C_4 + C_6 + C_7 + C_8)]}$$

The formula used for extrapolating the *vertically configured subsonic* wind tunnel maintenance costs to the 9 X 15 is as follows:

$$EF = \left\{ \frac{\left(\frac{T}{T_{9x15}}\right)^{1/2}}{[1 + (C_2 + C_3 + C_4 + C_6 + C_7 + C_8)]} \right\} X \left(\frac{A}{A_{9x15}}\right)$$

The formula used for extrapolating the blow down wind tunnel maintenance costs to the 1 X 1 is as follows:

$$EF = \left(\frac{T}{T_{1x1}}\right)^{1/2}$$

Where:

EF = the extrapolation factor or maintenance cost multiplier for the wind tunnel being analyzed
T = the test cell cross sectional area for the wind tunnel being analyzed
T_{9x15} = the test cell cross sectional area of the 9 X 15
T_{8x6} = the test cell cross sectional area of the 8 X 6
T_{1x1} = the test cell cross sectional area of the 1 X 1
A = facility size (gross square feet) of the wind tunnel being analyzed
A_{9x15} = facility size (gross square feet) of the 9 X 15
C_1 = maintenance factor if the wind tunnel is equipped with an auxiliary chiller plant. The value used is 0.25, but is adjustable (see prior detailed explanation).
C_2 = maintenance factor if the wind tunnel does not use process cooling water. The value used is 0.06, but is adjustable (see prior detailed explanation).
C_3 = maintenance factor if the wind tunnel is not equipped with a dryer. The value used is 0.15, but is adjustable (see prior detailed explanation).
C_4 = maintenance factor if the wind tunnel has one drive motor. The value used is 0.09, but is adjustable (see prior detailed explanation).
C_5 = maintenance factor if the wind tunnel has 6 or more drive motors. The value used is 0.38, but is adjustable (see prior detailed explanation).
C_6 = maintenance factor if the wind tunnel is equipped with a fan instead of a compressor. The value used is 0.08, but is adjustable (see prior detailed explanation).
C_7 = maintenance factor if the wind tunnel is equipped with a solid state variable speed drive or a variable pitched fan. The value used is 0.09, but is adjustable (see prior detailed explanation).
C_8 = maintenance factor if the wind tunnel has a fixed nozzle. The value used is 0.05, but is adjustable (see prior detailed explanation).

Note: C_1 & C_5 were used to increase the value of the extrapolation factor, while $C_{2, 3, 4, 6, 7 \& 8}$ reduced the value of the extrapolation factor.

Extrapolation of custodial, refuse, grounds, pest control, road clearance, security, management, and telecommunications costs were based on facility size (gross square feet) and came from CBRE | Whitestone's MARS Facility Cost Forecast System.

Utility Costs

Glenn Research Center (GRC)

Commercially provided utilities - for electricity, natural gas and water, the average of the combined annual rates for FY 2011 and FY 2012 from the NASA Energy Tracking System (NETS) were used. For some of the buildings, low voltage electricity, natural gas and steam was not metered, for these cases the utilities were estimated based on square feet and utility use of similar facilities.

Central Process System (CPS) – Compressed Air/Altitude Exhaust/Chilled Water.
Since most of the Wind Tunnels at Lewis Field use either compressed air or altitude exhaust (in most cases both) from the Central Process Systems, these commodities were treated like any other utility and unit costs were estimated. This was done using the following methods:

1. First, the full load output of all high horsepower test equipment was converted from horse power to Mega Watts (MW).
2. Since NETS does not list the high voltage equipment power consumption, it had to be calculated. The operational times for each piece of equipment was used along with the peak load multiplied a diversity value (adjustable) to arrive at the high voltage electricity consumption.
3. The building utility costs for Building 64 and Building 5 (low voltage electricity, water, sewer and natural gas) plus the operations, maintenance, janitorial, and management costs were distributed to each piece of equipment based on a combination of horsepower and average annual runtime.
4. The estimated high voltage electricity costs for each piece of equipment were added to the costs calculated in Number 3 (above).
5. The cost for 450 PSIG air, also included the cost for 40 PSIG air and 150 PSIG air and likewise, the cost for 150 PSIG air included the cost of 40 PSIG air since the low pressure systems feed into the higher pressure systems.

It is important to note that the cost of these commodities can vary significantly based on annual runtimes. The more the equipment runs, the lower the unit cost since the fixed costs of running the plant can be spread over more run hours.

Process Cooling Water – The wind tunnels at GRC use process cooling primarily to keep the equipment cool and to remove heat from the wind tunnel air stream. The process cooling is provided by 5 cooling towers in various locations around Lewis Field. The cost for process cooling water was calculated as follows:

1. The average amount of make-up water used in FY 2011 and FY 2012, assuming 3 cycles of concentration and a typical temperature difference across the towers provided a total annual flow of process cooling water.

2. The management, operations, maintenance and utility costs (including make-up water and water treatment) for all towers and pumping stations were divided by the total production of process cooling water to arrive at a unit cost.

Steam costs were also estimated at Lewis Field since it is generated on site. The steam costs accounted for the following:

1. Cost of natural gas
2. Efficiency of the plant
3. Efficiency of the distribution system
4. Operations and maintenance costs for Building 12

Ames Research Center (ARC), Langley Research Center (LaRC) & Marshall Space Flight Center (MSFC) Utility Costs

Like GRC, the commercially supplied costs were taken from the FY 2011 and FY 2012 NETS Data. LaRC and ARC both have process cooling. 75% of the cost of process cooling is the cost of the make-up water, so the process cooling water costs were scaled by the ratio of the ARC costs to the GRC costs and the same for the LaRC costs. Central station compressed air costs for LaRC were obtained from Operational-Phase Life Cycle Assessment of Select NASA Ground Test Facilities. Actual utility rates in NETS were used for the MSFC Tunnels except for the high pressure air for which the LaRC rate was used.

Operational Times

Facility Operational Times: 41 – 80 hours hours/week was the range selected in the calibration sheet, which is the medium use selection in the MARS Calibration Sheet.
Wind Tunnel Run Times: these were established based on a combination of testing hours supplied by test personnel at GRC and the CPS scheduled utilities for each wind tunnel. One of three levels of operation were applied to each wind tunnel across the agency:

1. High – 600 hours of run time per year
2. Medium – 400 hours of run time per year
3. Low – 200 hours of run time per year

For the purpose of the model, all inactive facilities were assigned a default value of medium use so that ATP would be able to use these values to appropriately budget for maintenance costs should a wind tunnel become active again.

Annual Utility Usage by Wind Tunnel

Glenn Research Center (GRC)

The next step to determine the annual utility costs was to break out the utility use by wind tunnel. To do this, it was necessary to establish the “typical” operational characteristics of each wind tunnel at Lewis Field. It is understood that the type CPS utilities used and drive motor loads would vary based on the type and amount of testing, it was important for estimating utility usage for each tunnel to establish a “typical” or “average” operation. This was done through

discussions with the CPS dispatch personnel. This information was needed coupled with the tunnel operational times to determine the wind tunnel drive motor electricity consumption, high pressure air consumption, service air consumption and altitude exhaust consumption for the 1X1, IRT, 8X6/9X15 and 10X10.

The next step was to estimate the process cooling water consumption for each tunnel. All the wind tunnels modeled at Lewis Field except the IRT used process cooling water in the operation. The 1X1 used process cooling water for cooling the hydraulic oil and for the spray cooler. The 8X6/9X15 and 10X10 used process cooling water for electrolyte cooling, motor cooling, oil cooling, dryer cooling and wind tunnel air stream cooling. While on site, pipe sizes were recorded, pipe flow velocities were assumed based on pipe size and standard design practice, then, flow rates were calculated. The flow rates were multiplied by a diversity factor (adjustable) and wind tunnel operational time to get total process water consumed annually per wind tunnel.

Finally, the building utilities, drive motor electricity consumption, CPS utilities and process cooling water consumption was summed up to determine the total annual utility usage for each wind tunnel by utility.

As mentioned in the beginning of this section, where there were gaps in building utility information (low voltage electricity, steam and natural gas), those annual consumption numbers were estimated. Building utilities for the 1X1 had to be estimated by square foot since it only occupies a portion of Building 37. Utilities were also estimated for Buildings 61 and 113 (8X6/9X15 and 10X10 Model Shops) since they were not individually metered. Steam was not metered in any of the facilities, so all those values were estimated using the steam consumption values per square foot from another facility at Lewis Field.

The utilities for the Hypersonic Test Facility (HTF) at Plum Brook Station (PBS) included estimates for the high pressure air (based on the amount of air moved and runtime) and the 3 MW heaters as well as the building utilities. The LaRC cost for the high pressure air was used for the HTF. The building utilities are actuals and are a little low since the facility is currently inactive.

Ames Research Center (ARC)

The utilities estimated for the Unitary Wind Tunnel at ARC were from an accompanying appendix to this original report. The utilities for the National Full Scale (NFS) – 40X80/80X120, 7X10 and 12 Foot Pressure wind tunnels were estimated by calculating the drive motor power consumption and combining the values with the rest of the building utilities which were taken from NETS.

Langley Research Center (LaRC)

The utilities for the 14X22 Wind Tunnel were estimated by calculating the drive motor power consumption and combining the values with the rest of the building utilities from NETS.

The 20 foot Vertical Spin Tunnel (VST), 12 foot Low Speed Tunnel (LST) and the 20” CF_4 Wind Tunnels used the actual metered data from NETS for annual utility usage.

The National Transonic Facility (NTF) has an LN2 plant associated with the operation and those utilities and maintenance costs are not included in this study. It was assumed the annual

electricity consumption listed in NETS was for low voltage power only. The drive motor power was calculated separately. Steam and compressed air use was pulled from an accompanying appendix to this original report. Process cooling water use was calculated from the annual make-up water requirements, cycles of concentration and the average temperature difference across the tower. The utilities for the Transonic Dynamics Tunnel (TDT) were calculated in the same manner. The Unitary Plan Wind Tunnel (UPWT) utilities were also estimated in the same manner except the building utilities were split in half since the UPWT shares Building 1251 with the 31" Mach 10 and the 15" Mach 6 Wind Tunnels.

The 8 foot High Temperature Tunnel (HTT) utilities were estimated using actual utility data from NETS for natural gas and electricity. Steam and compressed air quantities were taken from an accompanying appendix to this original report.

The 0.3 Meter Cryogenic Wind Tunnel building utilities were estimated using the data out of NETS. The drive motor electricity use was calculated separately and the steam use was scaled proportionally by square foot off the actual steam usage in Building 1212C.

The 31" Mach 10 and the 15" Mach 6 Wind Tunnels share approximately one half of Building 1251 with the UPWT. The remaining utilities not applied to the UPWT were split evenly between the two tunnels except for compressed air which was scaled based on test cell area. The values used to scale the compressed air were from an accompanying appendix to this original report.

Building 1247D houses the 20" Mach 6 Wind Tunnel along with a number of other test cells. Since there was no way to separate the utilities for the 20" Mach 6 from the rest of the building it was assumed the 20" Mach 6 Tunnel used the same building utilities as the 31" Mach 10 and the 15" Mach 6 Tunnels in Building 1251. The high pressure air consumption was scaled based on test cell size.

Marshall Space Flight Center (MSFC)

MSFC has two inactive wind tunnels; the High Reynolds Number Wind Tunnel in Building 4775 and the Trisonic Wind Tunnel in Building 4732. For both tunnels the electricity use was taken from NETS. The steam at MSFC is supplied by the Army and not generally metered at the building level, so steam was scaled by square foot from the usage in another facility. Since these are both blow-down tunnels, the compressed air use was scaled off the LaRC 31" Mach 10 and the 15" Mach 6 Wind Tunnels compressed air use by test cell cross sectional area. As mentioned earlier, the LaRC high pressure compressed air rates were used.

Size and Current Replacement Value (CRV)

The size and Current Replacement Value (CRV) values came from NASA's Real Property Management System (RPMS). There were several assumptions used which are listed below:

1. The 8X6/9X15 is made up of Buildings 39, 53, 54, 57, & 61. The control room is in Building 54 and only the control room portion of Building 54 was included in the model since the rest of Building 54 is office space. The size of the control room was measured on site and is about 2900 square feet. The CRV was estimated from RS Means for computer rooms and adjusted for the Cleveland area.

2. The IRT includes the IRT refrigeration plant size and CRV since it is used exclusively for the operation of the IRT.
3. The 1X1 in housed in Building 37, but does not take up the entire building. The size was measured on site and the CRV was prorated based on the gross square feet and CRV of Building 37.
4. The 20” Mach 6 Wind Tunnel at LaRC is housed in Building 1247D with other test cells. The CRV and size listed is for the entire building.
5. The 31” Mach 10 Wind tunnel and the 15” Mach 6 HTT are both located in Building 1251A. The size and CRV listed is for the entire building.
6. FY 2012 data was used to be consistent with the previously modeled facilities.

All the other sizes and CRV’s are right out of the RPMS with no further explanation required.

Some Final Comments

It is important to understand the limitations of a study like this; first, we performed a detailed analysis on two very different wind tunnel facilities to come up with an accurate estimate of operations and maintenance costs over the life cycle of those facilities. This is not to be confused with what NASA is spending, but rather what NASA should be spending on those facilities. This information was used to extrapolate O & M costs to 21 other wind tunnel facilities. There are vast differences between wind tunnels based on their testing capabilities and we tried to take care of these differences as best as possible with the extrapolation factors. While using test cell size and air velocity as a basis for the extrapolation may not be perfect, it turned out to be a much better fit than facility size. As mentioned earlier in the report, technical facilities are not like office space or warehouses where extrapolation by size is a pretty good fit.

Because we only had the resources to look at two facilities, the sample size and therefore the accuracy is at the lower end of the scale. Estimating O & M cost is not an accurate science and predicting failure or equipment life span is not easy. Things like environmental conditions, manufacturing processes and tolerances, quality of components, materials, workmanship, weather, installation, commissioning, quality assurance, level of preventative maintenance and predictive testing and inspection all play a part in determining how long a building system or component might last.

Finally, the costs are presented as total annual costs, cost per Gross Square Foot (GSF) and cost as a percentage of Current Replacement Value (CRV) of the facility. The focus should be on the total cost, not percent of CRV or cost per GSF, these numbers are for comparison purposes only. Percent of CRV or cost per GSF for wind tunnels has very little meaning since size was not used to extrapolate costs and the NASA CRV’s tend to be less accurate for technical facilities.

Attachment B: Detailed MARS Reports for GRC Property No. 39/53/54/57/61

Average M&R Costs

Whitestone Research

Building: Supersonic Wind Tunnel (SWT)
Building Number: 0039
Facility: Glenn Research Center
City: Cleveland, OH

GSFT: 37,351
PRV: $50,971,723
Built Date: 1949

M&R Average Annual Cost Forecasts

	Current Year	5 Year	20 Year	50 Year
PM & Minor Repair:	$170,769	$141,345	$132,808	$131,804
Unscheduled Maintenance:	$59,616	$44,971	$40,023	$39,576
Renewal & Replacement:	$15,000	$78,527	$274,075	$266,883
Total M&R Costs:	$245,385	$264,843	$446,906	$438,263
Per GSFT:	$6.57	$7.09	$11.97	$11.73
As % of PRV:	0.48%	0.52%	0.88%	0.86%

All costs expressed in ($) 2012.
Based on a 50-Year Forecast.

Building Component List

Whitestone Research

Building: Supersonic Wind Tunnel (SWT) **Year Built:** 1949 **Building Type:** Non-Temperature Controll

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0039

City: Cleveland, OH **Replacement Value:** $50,971,723 **per SF:** $1,365 **Building Gsft:** 37,351

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
B1020		Steel Roof Access Ladder	1960	270 Ln Ft		
B2010		Aluminum Louver, 1st Floor	1980	3 Each		
B2010		Concrete Block, Painted, Exterior, 1st Floor	1983	595 Sq Ft		
B2010		Concrete, Painted, Exterior, Pre-Cast	1949	17945 Sq Ft		
B2010		Concrete, Painted, Exterior, Pre-Cast	1949	26365 Sq Ft		
B2010		Concrete, Painted, Exterior, Pre-Cast	1965	23525 Sq Ft		
B2010		Steel, Exterior, 1st Floor	1965	180 Sq Ft		
B2010		Steel, Insulated Wall Panels, Painted, Exterior, 2"	1965	410 Sq Ft		
B2030		Steel Exterior Door, Sliding, Motor-Operated	1949	3 Each		
B2030		Steel Exterior Door, Swinging, Motor-Operated	1949	1 Each		
B2030		Steel, 26'x20', Painted, Overhead Coiling Door, Motorized	1990	2 Each		
B2030		Steel, Exterior Door	1949	12 Each		
B2030		Steel, Painted, Exterior Double Door	1949	3 Each		
B3010		Built-up Roof	1965	8400 Sq Ft		
B3010		Metal Roof	1965	260 Sq Ft		
B3010		Metal Roof	1949	3650 Sq Ft		
B3010		Single-Ply Modified Bituminous/Thermoplastic Roof	1990	22850 Sq Ft		
B3010		Stainless Steel Gutter, Downspouts, Fittings	1990	2 K Ln Ft		
C1020		Steel, Painted, Interior Double Door	1949	10 Each		
C1020		Steel, Painted, w/ Safety Glass, Interior Door	1970	1 Each		
C1020		Steel, Vault Security, Interior Door	1949	2 Each		
C2010		Concrete, Interior Stairs	1949	75 Sq Ft		
C2010		Metal, Painted, Interior Railing	1975	75 Ln Ft		
C2010		Metal, Painted, Interior Railing	1949	200 Ln Ft		
C2010		Metal, Painted, Interior Railing	1988	400 Ln Ft		
C2010		Metal, Painted, Interior Railing	1949	80 Ln Ft		
C2010		Metal, Painted, Interior Stairs	1949	250 Sq Ft		
C2010		Metal, Painted, Interior Stairs	1975	50 Sq Ft		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
C2010		Metal, Painted, Interior Stairs	1988	350 Sq Ft		
C3010		Concrete Block, Painted, Interior Wall Finish	2000	480 Sq Ft		
C3010		Concrete Block, Painted, Interior Wall Finish	1965	400 Sq Ft		
C3010		Concrete, Interior Wall Finish	1949	40920 Sq Ft		
C3010		Concrete, Interior Wall Finish	1970	27280 Sq Ft		
C3010		Concrete, Painted, Interior Wall Finish	1970	3300 Sq Ft		
C3010		Fiberglass Paneling	1988	600 Sq Ft		
C3010		Steel, Interior Wall Finish	2013	7470 Sq Ft		
C3010		Steel, Painted, Interior Wall Finish	1970	2340 Sq Ft		SS
C3010		Steel, Painted, Interior Wall Finish	1949	14650 Sq Ft		
C3010		Steel, Painted, Interior Wall Finish	1970	1115 Sq Ft		
C3010		Steel, Painted, Interior Wall Finish	1988	600 Sq Ft		
C3020		Concrete Flooring	1949	12510 Sq Ft		
C3020		Concrete Flooring	1970	18765 Sq Ft		
C3020		Fiberglass Grating	1988	1500 Sq Ft		
C3020		Metal Floor Grating	1965	550 Sq Ft		
C3020		Metal Floor Grating	1949	450 Sq Ft		
C3020		Metal Floor Grating	1988	2040 Sq Ft	test cell	
C3020		Steel Flooring	1949	190 Sq Ft		
C3020		Steel Flooring	1949	190 Sq Ft		SS
C3020		Steel Flooring	1970	390 Sq Ft		SS
C3020		Vinyl Tile Flooring	1988	1050 Sq Ft	test cell	
C3020		Vinyl Tile Flooring	2000	200 Sq Ft	low speed control room	
C3020		Vinyl Tile Flooring	1995	1050 Sq Ft	test cell	
C3030		Acoustical Tile, Dropped Ceiling	2000	200 Sq Ft	low speed control room	
C3030		Concrete Ceiling	1949	17838 Sq Ft		
C3030		Concrete Ceiling	1970	11892 Sq Ft		
C3030		Fiberglass Paneling	1988	350 Sq Ft		
C3030		Metal, Painted Ceiling	1949	2160 Sq Ft		
C3030		Metal, Painted Ceiling	1970	4000 Sq Ft		
D1010		Bridge Crane, Overhead, 3 Ton	1960	1 Each	9'x15' Shop area	
D1010		Wheel Chair Lift, Vertical	2000	1 Each	9'x15' Shop area	
D2010		Lavatory, Vitreous China	1990	1 Each		
D2010		Tankless Water Closet	1990	1 Each		
D2010		Water Cooler, Electric	2005	2 Each		
D2020		Pipe & Fittings, 3/4" Copper, Cold Water	1990	0.1 K Ln Ft		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D2020		Pipe & Fittings, 3/4" Copper, Hot Water	1990	0.1 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Cold Water	1990	0.1 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Hot Water	1990	0.1 K Ln Ft		
D2030		Backflow Preventer, 4"	2002	1 Each		
D2030		Pipe & Fittings, 3" Cast Iron	1949	0.75 K Ln Ft		
D2030		Pipe & Fittings, 4" Cast Iron	1949	0.35 K Ln Ft		
D2030		Pipe & Fittings, 6" Cast Iron	1949	0.25 K Ln Ft		
D3010		Ball Valve, 2"	1993	2 Each		
D3010		Ball Valve, 4"	1993	2 Each		
D3010		Flow Control Valve, Motorized, 4"	1993	2 Each		
D3010		Pipe & Fittings, 2" Steel, Gas	1960	0.45 K Ln Ft		
D3010		Pipe & Fittings, 4" Steel, Gas	1960	1 K Ln Ft		
D3010		Pressure Reducer Valve, 4"	1993	1 Each		
D3010		Pressurized Tank, 250 Gal.	1959	26 Each	ext	N2
D3020		Condensate Receiver Station, 10-15 Gal.	1995	1 Each		
D3020		Pipe & Fittings, 1" Steel	1949	1.2 K Ln Ft		
D3020		Pipe & Fittings, 2" Steel	1949	1.5 K Ln Ft		
D3020		Steam Trap, F&T, 1"	1960	7 Each		
D3020		Steam Trap, F&T, 2"	1965	4 Each		
D3030		Butterfly Valve, 18"	1970	1 Each	ext	
D3030	FCV-2, 3	Flow Control Valve, Motorized, 12"	2005	2 Each		hydraulic
D3030		Flow Control Valve, Motorized, 2"	1990	4 Each		
D3030		Flow Control Valve, Motorized, 20"	2010	1 Each	Valve House	
D3030		Flow Control Valve, Motorized, 20"	2005	1 Each	Valve Shed	
D3030	FCV-4	Flow Control Valve, Motorized, 6"	2005	1 Each		hydraulic
D3030		Flow Control Valve, Motorized, 6"	1990	2 Each		
D3030		Flow Control Valve, Motorized, 8"	1990	4 Each		
D3030		Gate Valve, 2-3"	2013	2 Each		
D3030		Gate Valve, 8"	1990	12 Each	ext	
D3030		Pipe & Fittings, 1" Steel	1949	1 K Ln Ft		
D3030		Pipe & Fittings, 12" Steel	1949	0.25 K Ln Ft		
D3030		Pipe & Fittings, 18" Steel	1990	0.2 K Ln Ft		
D3030		Pipe & Fittings, 2" Steel	1949	0.5 K Ln Ft		
D3030		Pipe & Fittings, 4" Steel	1949	0.45 K Ln Ft		
D3030		Pipe & Fittings, 6" Steel	1949	0.8 K Ln Ft		
D3030		Pipe Insulation, Fiberglass, Chilled Water	2000	2 K Ln Ft		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D3030		Strainer, Cast Iron, 20"	1949	2 Each		
D3040		Ductwork	2005	1500 Lbs		
D3040		Ductwork	1990	1000 Lbs		
D3040		Exhaust Fan, Ceiling, 200-500 Cfm	1990	1 Each		
D3040		Exhaust Fan, Centrifugal, 2,000 Cfm	1990	1 Each		
D3040		Exhaust Fan, Double Width, Double Inlet Airfoil, 1,000 Cfm	1990	3 Each		
D3040		Exhaust Fan, Propeller, 800 Cfm	1993	1 Each		
D3040		Steel Damper, Motorized, w/ Actuator	1995	2 Each		
D3050		Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton	2005	2 Each		
D3050		Fan Coil, Two-Pipe, 800 Cfm	1965	5 Each		
D3050		Unit Heater, 12 Mbh	1960	4 Each		
D3050		Unit Heater, 36 Mbh	1980	1 Each		
D3050		Unit Heater, 480v, 5kW	1990	3 Each		
D3060		Direct Digital Controls, System Points	2010	566 Each		
D3060		Meter, Natural Gas, w/ Digital Pulser, 400 Chf	1993	1 Each		
D3060		Pressure Switch	1993	4 Each		
D3060		Thermostat	1988	4 Each		
D3060		Thermostat	1970	4 Each		
D5010		Disconnect Switch, 100 Amp.	1980	1 Each		
D5010		Disconnect Switch, 100 Amp.	1990	4 Each		
D5010		Disconnect Switch, 30 Amp.	1990	1 Each		
D5010		Disconnect Switch, 30 Amp.	1949	2 Each		
D5010		Disconnect Switch, 30 Amp.	1990	11 Each		
D5010		Disconnect Switch, 30 Amp.	2006	5 Each		
D5010		Disconnect Switch, 60 Amp.	1990	3 Each		
D5010		Motor Starter, <5HP, <600V	2000	2 Each		
D5010		Motor Starter, <5HP, <600V	1949	1 Each		
D5010		Motor Starter, 5-20 HP, <600 V	1990	1 Each		
D5010		Motor Starter, 5-20 HP, <600 V	1970	3 Each		
D5010	PXR0302	Power Panel Board, 208 Y/120 V, 100 Amp.	1990	1 Each		
D5010	PXR0201A, 201B	Power Panel Board, 208 Y/120 V, 100 Amp.	1990	2 Each		
D5010	P0101	Power Panel Board, 208 Y/120 V, 200 Amp.	2000	1 Each		
D5010	PXR0301	Power Panel Board, 208 Y/120 V, 225 Amp	1996	1 Each		
D5010	PXR09A01, 2, 3	Power Panel Board, 208 Y/120 V, 225 Amp	1990	3 Each		
D5010	F0204, PXR0401	Power Panel Board, 208 Y/120 V, 225 Amp	1990	2 Each		
D5010	PXR0205	Power Panel Board, 480 V, 200 Amp.	1949	1 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D5010	PXR09	Secondary Transformer, Dry, 45 kVA	1960	1 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1990	5 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1970	1 Each		
D5020		Exit Lighting Fixture, LED	2006	2 Each		
D5020		Exit Lighting Fixture, w/ Battery	1980	1 Each		
D5020		Exit Lighting Fixture, w/ Battery	1995	2 Each		
D5020		Fluorescent Lighting Fixture, T12, 2-60 w	1990	46 Each		
D5020		Fluorescent Lighting Fixture, T12, 2-60 w	1975	23 Each		
D5020		Fluorescent Lighting Fixture, T12, 4-60 w	1990	9 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2006	2 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2000	6 Each		
D5020		Halogen Lighting Fixture, 250 w	1995	18 Each		
D5020		Halogen Lighting Fixture, 250 w	1970	1 Each		
D5020		Incandescent Lighting Fixture, Basic, 100 w	1960	5 Each	Exterior	
D5020		Incandescent Lighting Fixture, Basic, 100 w	1990	29 Each		
D5020		Incandescent Lighting Fixture, EP, 200 w	1949	2 Each		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150 w	1995	9 Each		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150 w	1995	31 Each	Interior	
D5030		Camera, Interior, Closed Circuit, PTZ Color	2012	11 Each		
D5030		Card Reader w/ Keypad	2006	3 Each		
D5030		Electric Lock	2006	3 Each		
D5030		Fire Alarm Horn & Strobe	1990	3 Each		
D5030		Intrusion Detection Motion Detector, Interior	2006	5 Each		
D5030		Manual Pull Station	1990	1 Each		
D5030		Public Address Speaker	1970	6 Each		
D5030		Smoke Detector	1995	2 Each		
D5090		Grounding System	1980	2.5 K Ln Ft		
D5090		Lightning Protection System	1990	1.9 K Ln Ft		
D5090		Meter, Electrical, 208 Volt, 400 Amp.	1990	3 Each		
E1020		Vacuum Pump, 3 HP	2000	2 Each		
E1020		Vacuum Pump, 30 HP	2010	1 Each		
F1030		8x6 Altitude Exhaust System Valves	1949	1 Each		
F1030		8x6 CAD Valve	1949	1 Each		
F1030		8x6 Cooler CTW Valve	1949	1 Each		
F1030		8x6 Cooler Strainer	1949	1 Each		
F1030		8x6 CTW G5E 480V Switchgear	1949	1 Each		

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All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
F1030		8x6 Electric Motor	1949	1 Each		
F1030		8x6 Expansion Joint	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Filter	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Hose	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Pump	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Relief Valves	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Strainer	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Support Bearings	1949	1 Each		
F1030		8x6 Flexwall Hydraulic Tank	1949	1 Each		
F1030		8x6 GHS Exhaust Fan	1949	1 Each		
F1030		8x6 Low Voltage Meggering Bldg 39	1949	1 Each		
F1030		8x6 Model Motor Megger	1949	1 Each		
F1030		8x6 Model Motor Megger	1949	1 Each		
F1030		8x6 Oil Sample	1949	1 Each		
F1030		8x6 Oil Sample	1949	1 Each		
F1030		8x6 Relief Valve	1949	1 Each		
F1030		8x6 SWT Low Voltage Meggering	1949	1 Each		
F1030		8x6 SWT Model Motor Megger	1949	1 Each		
F1030		8x6 Test Section Strut	1949	1 Each		
F1030		8x6 Tunnel Baffles	1949	1 Each		
F1030		8x6 Tunnel Concrete Shell	1949	1 Each		
F1030		8x6 Tunnel Cooler Supply/Return Valves	1949	1 Each		
F1030		8x6 Tunnel Diffuser	1949	1 Each		
F1030		8x6/9x15 Air System Filter	1949	1 Each		
F1030		8x6/9x15 Air System Hose	1949	1 Each		
F1030		8x6/9x15 Air System Relief Valves	1949	1 Each		
F1030		8x6/9x15 Air Systems Heater	1949	1 Each		
F1030		8x6/9x15 Air Systems Seperators	1949	1 Each		
F1030		8x6/9x15 Diffuser Bay Doors	1949	1 Each		
F1030		8x6/9x15 Flexwall Hydraulic Gearbox	1949	1 Each		
F1030		8x6/9x15 Flow Control Door	1949	1 Each		
F1030		8x6/9x15 Hydraulic Motor	1949	1 Each		
F1030		8x6/9x15 Model Hydraulic Heat Exchanger	1949	1 Each		
F1030		8x6/9x15 Strut Motors Megger Test Section	1949	1 Each		
F1030		8x6/9x15 SWT Model Hydraulic Fluid	1949	1 Each		
F1030		8x6/9x15 SWT Model Hydraulic Pump	1949	1 Each		

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
F1030		8x6/9x15 Tunnel Work Hatch	1949	1 Each		
F1030		9x15 Pressure Certification	1949	1 Each		

Building Extended Component List with Remaining Service Life

Whitestone Research 04-Jun-15

Building: Supersonic Wind Tunnel (SWT) **Year Built:** 1949 **Building Type:** Non-Temperature Controll

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0039

City: Cleveland, OH **Replacement Value:** $50,971,723 **per SF:** $1,365 **Building Gsft:** 37,351

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
B1020		Steel Roof Access Ladder	1960	4	270 Ln Ft					
B2010		Aluminum Louver, 1st Floor	1980	26	3 Each					
B2010		Concrete Block, Painted, Exterior, 1st Floor	1983	69	595 Sq Ft					
B2010		Concrete, Painted, Exterior, Pre-Cast	1949	35	17945 Sq Ft					
B2010		Concrete, Painted, Exterior, Pre-Cast	1949	35	26365 Sq Ft					
B2010		Concrete, Painted, Exterior, Pre-Cast	1965	51	23525 Sq Ft					
B2010		Steel, Exterior, 1st Floor	1965	26	180 Sq Ft					
B2010		Steel, Insulated Wall Panels, Painted, Exterior,	1965	-9	410 Sq Ft	$8,297	$0	$8,297		
B2030		Steel Exterior Door, Sliding, Motor-Operated	1949	4	3 Each					
B2030		Steel Exterior Door, Swinging, Motor-Operated	1949	4	1 Each					
B2030		Steel, 26'x20', Painted, Overhead Coiling Door	1990	11	2 Each					
B2030		Steel, Exterior Door	1949	10	12 Each					
B2030		Steel, Painted, Exterior Double Door	1949	10	3 Each					
B3010		Built-up Roof	1965	-19	8400 Sq Ft	$93,503	$0	$93,503		
B3010		Metal Roof	1965	4	260 Sq Ft					
B3010		Metal Roof	1949	4	3650 Sq Ft					
B3010		Single-Ply Modified Bituminous/Thermoplastic	1990	2	22850 Sq Ft					
B3010		Stainless Steel Gutter, Downspouts, Fittings	1990	-4	2 K Ln Ft	$29,526	$0	$29,526		
C1020		Steel, Painted, Interior Double Door	1949	10	10 Each					
C1020		Steel, Painted, w/ Safety Glass, Interior Door	1970	31	1 Each					
C1020		Steel, Vault Security, Interior Door	1949	10	2 Each					

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Forecast Year: 2013

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
C2010		Concrete, Interior Stairs	1949	10	75 Sq Ft					
C2010		Metal, Painted, Interior Railing	1949	-15	80 Ln Ft	$2,422	$0	$2,422		
C2010		Metal, Painted, Interior Railing	1975	11	75 Ln Ft					
C2010		Metal, Painted, Interior Railing	1988	24	400 Ln Ft					
C2010		Metal, Painted, Interior Railing	1949	9	200 Ln Ft					
C2010		Metal, Painted, Interior Stairs	1949	9	250 Sq Ft					
C2010		Metal, Painted, Interior Stairs	1975	36	50 Sq Ft					
C2010		Metal, Painted, Interior Stairs	1988	49	350 Sq Ft					
C3010		Concrete Block, Painted, Interior Wall Finish	1965	26	400 Sq Ft					
C3010		Concrete Block, Painted, Interior Wall Finish	2000	61	480 Sq Ft					
C3010		Concrete, Interior Wall Finish	1949	10	40920 Sq Ft					
C3010		Concrete, Interior Wall Finish	1970	31	27280 Sq Ft					
C3010		Concrete, Painted, Interior Wall Finish	1970	31	3300 Sq Ft					
C3010		Fiberglass Paneling	1988	9	600 Sq Ft					
C3010		Steel, Interior Wall Finish	2013	74	7470 Sq Ft					
C3010		Steel, Painted, Interior Wall Finish	1970	31	2340 Sq Ft					SS
C3010		Steel, Painted, Interior Wall Finish	1949	10	14650 Sq Ft					
C3010		Steel, Painted, Interior Wall Finish	1970	31	1115 Sq Ft					
C3010		Steel, Painted, Interior Wall Finish	1988	49	600 Sq Ft					
C3020		Concrete Flooring	1949	10	12510 Sq Ft					
C3020		Concrete Flooring	1970	31	18765 Sq Ft					
C3020		Fiberglass Grating	1988	4	1500 Sq Ft					
C3020		Metal Floor Grating	1965	-19	550 Sq Ft	$8,473	$0	$8,473		
C3020		Metal Floor Grating	1949	-35	450 Sq Ft	$6,933	$0	$6,933		
C3020		Metal Floor Grating	1988	4	2040 Sq Ft				test cell	
C3020		Steel Flooring	1949	10	190 Sq Ft					
C3020		Steel Flooring	1970	31	390 Sq Ft					SS
C3020		Steel Flooring	1949	10	190 Sq Ft					SS

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Forecast Year: 2013

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
C3020		Vinyl Tile Flooring	2000	4	200 Sq Ft				low speed control room	
C3020		Vinyl Tile Flooring	1995	-1	1050 Sq Ft				test cell	
C3020		Vinyl Tile Flooring	1988	-8	1050 Sq Ft	$4,776	$0	$4,776	test cell	
C3030		Acoustical Tile, Dropped Ceiling	2000	21	200 Sq Ft				low speed control room	
C3030		Concrete Ceiling	1949	10	17838 Sq Ft					
C3030		Concrete Ceiling	1970	31	11892 Sq Ft					
C3030		Fiberglass Paneling	1988	9	350 Sq Ft					
C3030		Metal, Painted Ceiling	1949	10	2160 Sq Ft					
C3030		Metal, Painted Ceiling	1970	31	4000 Sq Ft					
D1010		Bridge Crane, Overhead, 3 Ton	1960	4	1 Each				9'x15' Shop area	
D1010		Wheel Chair Lift, Vertical	2000	11	1 Each				9'x15' Shop area	
D2010		Lavatory, Vitreous China	1990	11	1 Each					
D2010		Tankless Water Closet	1990	11	1 Each					
D2010		Water Cooler, Electric	2005	1	2 Each					
D2020		Pipe & Fittings, 3/4" Copper, Cold Water	1990	1	0.1 K Ln Ft					
D2020		Pipe & Fittings, 3/4" Copper, Hot Water	1990	1	0.1 K Ln Ft					
D2020		Pipe Insulation, Fiberglass, Cold Water	1990	1	0.1 K Ln Ft					
D2020		Pipe Insulation, Fiberglass, Hot Water	1990	1	0.1 K Ln Ft					
D2030		Backflow Preventer, 4"	2002	-2	1 Each	$5,259	$0	$5,259		
D2030		Pipe & Fittings, 3" Cast Iron	1949	10	0.75 K Ln Ft					
D2030		Pipe & Fittings, 4" Cast Iron	1949	10	0.35 K Ln Ft					
D2030		Pipe & Fittings, 6" Cast Iron	1949	10	0.25 K Ln Ft					
D3010		Ball Valve, 2"	1993	-6	2 Each	$1,231	$0	$1,231		
D3010		Ball Valve, 4"	1993	-6	2 Each	$2,155	$0	$2,155		
D3010		Flow Control Valve, Motorized, 4"	1993	15	2 Each					
D3010		Pipe & Fittings, 2" Steel, Gas	1960	21	0.45 K Ln Ft					
D3010		Pipe & Fittings, 4" Steel, Gas	1960	21	1 K Ln Ft					
D3010		Pressure Reducer Valve, 4"	1993	-16	1 Each	$3,089	$0	$3,089		

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Forecast Year: 2013

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3010		Pressurized Tank, 250 Gal.	1959	4	26 Each				ext	N2
D3020		Condensate Receiver Station, 10-15 Gal.	1995	-7	1 Each	$6,956	$0	$6,956		
D3020		Pipe & Fittings, 1" Steel	1949	10	1.2 K Ln Ft					
D3020		Pipe & Fittings, 2" Steel	1949	10	1.5 K Ln Ft					
D3020		Steam Trap, F&T, 1"	1960	-46	7 Each	$2,584	$0	$2,584		
D3020		Steam Trap, F&T, 2"	1965	-41	4 Each	$3,894	$0	$3,894		
D3030		Butterfly Valve, 18"	1970	-5	1 Each	$5,897	$0	$5,897	ext	
D3030	FCV-2, 3	Flow Control Valve, Motorized, 12"	2005	27	2 Each					hydraulic
D3030		Flow Control Valve, Motorized, 2"	1990	12	4 Each					
D3030		Flow Control Valve, Motorized, 20"	2005	27	1 Each				Valve Shed	
D3030		Flow Control Valve, Motorized, 20"	2010	32	1 Each				Valve House	
D3030	FCV-4	Flow Control Valve, Motorized, 6"	2005	27	1 Each					hydraulic
D3030		Flow Control Valve, Motorized, 6"	1990	12	2 Each					
D3030		Flow Control Valve, Motorized, 8"	1990	12	4 Each					
D3030		Gate Valve, 2-3"	2013	14	2 Each					
D3030		Gate Valve, 8"	1990	-9	12 Each	$44,439	$0	$44,439	ext	
D3030		Pipe & Fittings, 1" Steel	1949	10	1 K Ln Ft					
D3030		Pipe & Fittings, 12" Steel	1949	10	0.25 K Ln Ft					
D3030		Pipe & Fittings, 18" Steel	1990	51	0.2 K Ln Ft					
D3030		Pipe & Fittings, 2" Steel	1949	10	0.5 K Ln Ft					
D3030		Pipe & Fittings, 4" Steel	1949	10	0.45 K Ln Ft					
D3030		Pipe & Fittings, 6" Steel	1949	10	0.8 K Ln Ft					
D3030		Pipe Insulation, Fiberglass, Chilled Water	2000	11	2 K Ln Ft					
D3030		Strainer, Cast Iron, 20"	1949	-50	2 Each	$25,634	$0	$25,634		
D3040		Ductwork	1990	2	1000 Lbs					
D3040		Ductwork	2005	17	1500 Lbs					
D3040		Exhaust Fan, Ceiling, 200-500 Cfm	1990	-9	1 Each	$863	$0	$863		
D3040		Exhaust Fan, Centrifugal, 2,000 Cfm	1990	-9	1 Each	$2,041	$0	$2,041		

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Forecast Year: 2013

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3040		Exhaust Fan, Double Width, Double Inlet Airfoi	1990	-9	3 Each	$4,023	$0	$4,023		
D3040		Exhaust Fan, Propeller, 800 Cfm	1993	-6	1 Each	$1,068	$0	$1,068		
D3040		Steel Damper, Motorized, w/ Actuator	1995	1	2 Each					
D3050		Air Conditioner, Rooftop, Single Zone, 7-1/2 T	2005	23	2 Each					
D3050		Fan Coil, Two-Pipe, 800 Cfm	1965	-17	5 Each	$10,057	$0	$10,057		
D3050		Unit Heater, 12 Mbh	1960	-22	4 Each	$3,045	$0	$3,045		
D3050		Unit Heater, 36 Mbh	1980	-2	1 Each	$1,264	$0	$1,264		
D3050		Unit Heater, 480v, 5kW	1990	8	3 Each					
D3060		Direct Digital Controls, System Points	2010	6	566 Each					
D3060		Meter, Natural Gas, w/ Digital Pulser, 400 Chf	1993	4	1 Each					
D3060		Pressure Switch	1993	1	4 Each					
D3060		Thermostat	1970	-34	4 Each	$1,615	$0	$1,615		
D3060		Thermostat	1988	-16	4 Each	$1,615	$0	$1,615		
D5010		Disconnect Switch, 100 Amp.	1980	16	1 Each					
D5010		Disconnect Switch, 100 Amp.	1990	26	4 Each					
D5010		Disconnect Switch, 30 Amp.	2006	42	5 Each					
D5010		Disconnect Switch, 30 Amp.	1990	26	1 Each					
D5010		Disconnect Switch, 30 Amp.	1990	26	11 Each					
D5010		Disconnect Switch, 30 Amp.	1949	-15	2 Each	$875	$0	$875		
D5010		Disconnect Switch, 60 Amp.	1990	26	3 Each					
D5010		Motor Starter, <5HP, <600V	2000	4	2 Each					
D5010		Motor Starter, <5HP, <600V	1949	-47	1 Each	$703	$0	$703		
D5010		Motor Starter, 5-20 HP, <600 V	1970	-26	3 Each	$2,579	$0	$2,579		
D5010		Motor Starter, 5-20 HP, <600 V	1990	-6	1 Each	$860	$0	$860		
D5010	PXR0302	Power Panel Board, 208 Y/120 V, 100 Amp.	1990	6	1 Each					
D5010	PXR0201A, 201B	Power Panel Board, 208 Y/120 V, 100 Amp.	1990	6	2 Each					
D5010	P0101	Power Panel Board, 208 Y/120 V, 200 Amp.	2000	16	1 Each					
D5010	PXR09A01, 2, 3	Power Panel Board, 208 Y/120 V, 225 Amp	1990	6	3 Each					

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5010	PXR0301	Power Panel Board, 208 Y/120 V, 225 Amp	1996	12	1 Each					
D5010	F0204, PXR0401	Power Panel Board, 208 Y/120 V, 225 Amp	1990	6	2 Each					
D5010	PXR0205	Power Panel Board, 480 V, 200 Amp.	1949	-35	1 Each	$8,810	$0	$8,810		
D5010	PXR09	Secondary Transformer, Dry, 45 kVA	1960	-24	1 Each	$6,061	$0	$6,061		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1970	-24	1 Each	$1,147	$0	$1,147		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1990	-4	5 Each	$5,734	$0	$5,734		
D5020		Exit Lighting Fixture, LED	2006	12	2 Each					
D5020		Exit Lighting Fixture, w/ Battery	1980	-14	1 Each	$382	$0	$382		
D5020		Exit Lighting Fixture, w/ Battery	1995	1	2 Each					
D5020		Fluorescent Lighting Fixture, T12, 2-60 w	1975	-19	23 Each	$4,464	$0	$4,464		
D5020		Fluorescent Lighting Fixture, T12, 2-60 w	1990	-4	46 Each	$8,927	$0	$8,927		
D5020		Fluorescent Lighting Fixture, T12, 4-60 w	1990	-4	9 Each	$1,746	$0	$1,746		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2006	12	2 Each					
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2000	6	6 Each					
D5020		Halogen Lighting Fixture, 250 w	1970	-24	1 Each	$1,011	$0	$1,011		
D5020		Halogen Lighting Fixture, 250 w	1995	1	18 Each					
D5020		Incandescent Lighting Fixture, Basic, 100 w	1960	-34	5 Each	$778	$0	$778	Exterior	
D5020		Incandescent Lighting Fixture, Basic, 100 w	1990	-4	29 Each	$4,511	$0	$4,511		
D5020		Incandescent Lighting Fixture, EP, 200 w	1949	-45	2 Each	$2,658	$0	$2,658		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150	1995	1	31 Each				Interior	
D5020		Metal Halide Lighting Fixture, Wall Mount, 150	1995	1	9 Each					
D5030		Camera, Interior, Closed Circuit, PTZ Color	2012	8	11 Each					
D5030		Card Reader w/ Keypad	2006	2	3 Each					
D5030		Electric Lock	2006	2	3 Each					
D5030		Fire Alarm Horn & Strobe	1990	-4	3 Each	$532	$0	$532		
D5030		Intrusion Detection Motion Detector, Interior	2006	2	5 Each					
D5030		Manual Pull Station	1990	-9	1 Each	$151	$0	$151		
D5030		Public Address Speaker	1970	-29	6 Each	$2,011	$0	$2,011		

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5030		Smoke Detector	1995	-4	2 Each	$352	$0	$352		
D5090		Grounding System	1980	-9	2.5 K Ln Ft	$10,300	$0	$10,300		
D5090		Lightning Protection System	1990	1	1.9 K Ln Ft					
D5090		Meter, Electrical, 208 Volt, 400 Amp.	1990	6	3 Each					
E1020		Vacuum Pump, 3 HP	2000	1	2 Each					
E1020		Vacuum Pump, 30 HP	2010	6	1 Each					
F1030		8x6 Altitude Exhaust System Valves	1949	NA	1 Each					
F1030		8x6 CAD Valve	1949	NA	1 Each					
F1030		8x6 Cooler CTW Valve	1949	NA	1 Each					
F1030		8x6 Cooler Strainer	1949	NA	1 Each					
F1030		8x6 CTW G5E 480V Switchgear	1949	NA	1 Each					
F1030		8x6 Electric Motor	1949	NA	1 Each					
F1030		8x6 Expansion Joint	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Filter	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Hose	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Pump	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Relief Valves	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Strainer	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Support Bearings	1949	NA	1 Each					
F1030		8x6 Flexwall Hydraulic Tank	1949	NA	1 Each					
F1030		8x6 GHS Exhaust Fan	1949	NA	1 Each					
F1030		8x6 Low Voltage Meggering Bldg 39	1949	NA	1 Each					
F1030		8x6 Model Motor Megger	1949	NA	1 Each					
F1030		8x6 Model Motor Megger	1949	NA	1 Each					
F1030		8x6 Oil Sample	1949	NA	1 Each					
F1030		8x6 Oil Sample	1949	NA	1 Each					
F1030		8x6 Relief Valve	1949	NA	1 Each					
F1030		8x6 SWT Low Voltage Meggering	1949	NA	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
F1030		8x6 SWT Model Motor Megger	1949	NA	1 Each					
F1030		8x6 Test Section Strut	1949	NA	1 Each					
F1030		8x6 Tunnel Baffles	1949	NA	1 Each					
F1030		8x6 Tunnel Concrete Shell	1949	NA	1 Each					
F1030		8x6 Tunnel Cooler Supply/Return Valves	1949	NA	1 Each					
F1030		8x6 Tunnel Diffuser	1949	NA	1 Each					
F1030		8x6/9x15 Air System Filter	1949	NA	1 Each					
F1030		8x6/9x15 Air System Hose	1949	NA	1 Each					
F1030		8x6/9x15 Air System Relief Valves	1949	NA	1 Each					
F1030		8x6/9x15 Air Systems Heater	1949	NA	1 Each					
F1030		8x6/9x15 Air Systems Seperators	1949	NA	1 Each					
F1030		8x6/9x15 Diffuser Bay Doors	1949	NA	1 Each					
F1030		8x6/9x15 Flexwall Hydraulic Gearbox	1949	NA	1 Each					
F1030		8x6/9x15 Flow Control Door	1949	NA	1 Each					
F1030		8x6/9x15 Hydraulic Motor	1949	NA	1 Each					
F1030		8x6/9x15 Model Hydraulic Heat Exchanger	1949	NA	1 Each					
F1030		8x6/9x15 Strut Motors Megger Test Section	1949	NA	1 Each					
F1030		8x6/9x15 SWT Model Hydraulic Fluid	1949	NA	1 Each					
F1030		8x6/9x15 SWT Model Hydraulic Pump	1949	NA	1 Each					
F1030		8x6/9x15 Tunnel Work Hatch	1949	NA	1 Each					
F1030		9x15 Pressure Certification	1949	NA	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

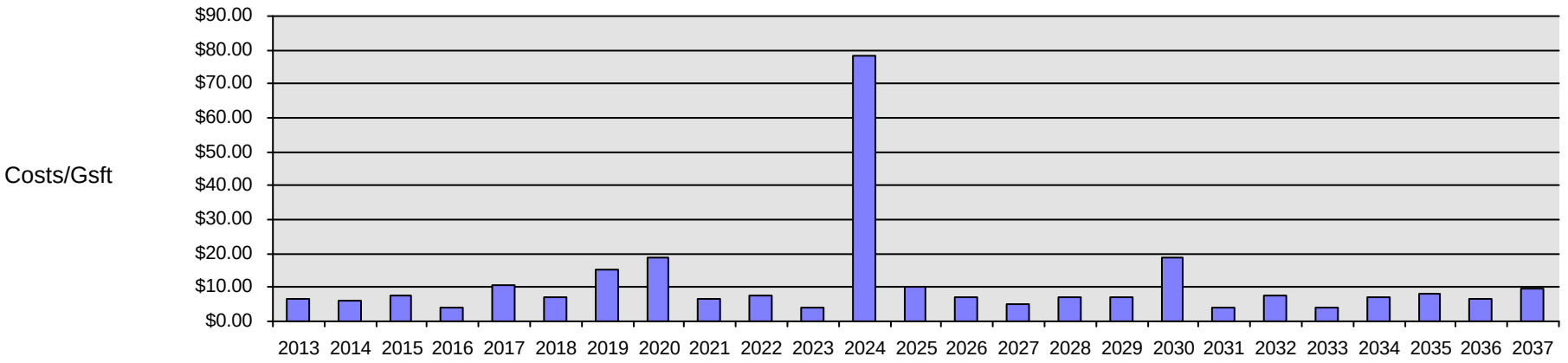
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center **City:** Cleveland, OH

37351

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
A10 Foundations																									
A20 Basement Construction																									
B10 Super Structure							0.61															0.18			
B20 Exterior Enclosure	0.08	0.07	1.40	0.05	0.05	0.05	3.42	0.11	0.05	0.05	0.08	1.10	1.80	0.05	0.05	0.05	2.05	0.06	0.05	0.05	0.15	0.22	1.15	0.05	0.05
B30 Roofing	0.18	0.20	0.28	0.18	4.69	0.18	1.33	0.20	0.18	0.27	0.18	0.21	2.66	0.18	1.53	0.18	0.21	0.95	0.18	0.27	0.18	0.21	0.20	0.18	4.69
C10 Interior Construction	0.02	0.02	0.00		0.02	0.00	0.13	0.01	0.02	0.00		0.89	0.00	0.00		0.02	0.02	0.01		0.02		0.13	0.00	0.02	
C20 Stairs	0.02		0.00	0.03	0.02	0.04	0.00	0.03	0.02		0.00	0.57	0.07		0.00	0.04	0.01		0.00	0.04	0.05		0.01	0.04	0.01
C30 Interior Finishes	2.65	1.67	0.17		2.51	3.16	0.62	1.29	2.51	1.67	0.29	68.82	0.30	1.67	0.00	2.87	0.01	2.20	0.13	2.51	0.01	2.29	0.04	2.53	
D10 Conveying	0.09	0.09	0.09	0.09	0.09	0.09	1.82	0.09	0.09	0.09	0.09	0.09	0.36	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
D20 Plumbing	0.02	0.02	0.12	0.02	0.02	0.02	0.02	0.03	0.04	0.14	0.02	0.45	0.12	0.02	0.02	0.02	0.02	0.02	0.02	0.14	0.02	0.02	0.10	0.04	0.02
D30 HVAC	1.32	1.25	1.32	1.27	1.22	1.35	4.24	12.49	1.30	2.20	1.42	3.03	1.61	2.44	1.24	1.38	1.69	11.04	1.45	1.21	1.27	1.21	3.00	1.29	2.75
D40 Fire Protection																									
D50 Electrical	0.26	0.28	2.18	0.51	0.27	0.34	0.27	2.28	0.31	1.16	0.27	0.36	1.05	0.72	0.30	0.28	0.35	1.77	0.26	1.17	0.30	0.28	1.53	0.57	0.26
E10 Equipment	0.07	0.07	0.30	0.07	0.07	0.07	0.07	0.41	0.07	0.07	0.07	0.07	0.09	0.07	0.07	0.07	0.07	0.62	0.07	0.07	0.07	0.07	0.09	0.07	0.07
E20 Furnishings																									
F10 Special Construction	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87
F20 Selective Bldg Demolition																									
G10 Site Preparation																									
G20 Site Improvements																									
G30 Site Mechanical Utilities																									
G40 Site Electrical Utilities																									
G90 Other Site Construction																									
Total	**6.57**	**6.25**	**7.74**	**4.08**	**10.82**	**7.17**	**15.13**	**18.80**	**6.46**	**7.53**	**4.29**	**78.14**	**9.93**	**7.12**	**5.18**	**6.86**	**7.08**	**18.62**	**4.12**	**7.43**	**4.01**	**7.25**	**8.07**	**6.75**	**9.81**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 1-25

Based on a 50-Year Forecast.

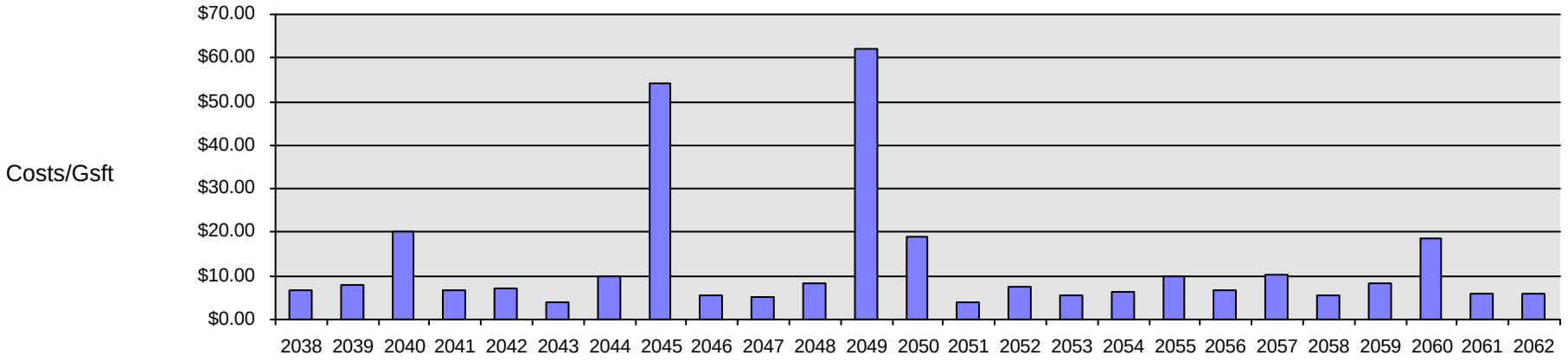
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0039 **GSFT:** 37351

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2	**Total**
A10 Foundations																										**0.00**
A20 Basement Construction																										**0.00**
B10 Super Structure												0.18										0.61				**1.58**
B20 Exterior Enclosure	0.05	2.14	0.60	0.05	0.05	0.08	0.22	1.36	0.05	0.05	0.05	54.31	0.06	0.05	0.05	0.08	0.32	1.15	0.05	0.05	0.12	2.05	0.76	0.05	0.05	**76.15**
B30 Roofing	0.18	0.23	1.38	0.18	0.27	0.18	0.21	0.20	0.18	1.53	0.18	0.21	0.95	0.18	0.27	0.18	0.21	2.66	0.18	4.69	0.18	1.33	0.20	0.18	0.27	**36.06**
C10 Interior Construction	0.00	0.03	0.03		0.00		0.15	0.04			0.02	0.02	0.00		0.02	0.00	0.14	0.01	0.02	0.00		0.02	0.02	0.00		**1.83**
C20 Stairs	0.34	0.03	0.03	0.01	0.01	0.00	0.03	0.01	0.01	0.00	0.05	0.07	0.07		0.03	0.02	0.04	0.00	0.03	0.01	0.02		0.03	0.01	0.02	**1.85**
C30 Interior Finishes	2.21	0.25	3.13		1.80	0.01	3.12	48.02			3.96	3.10	0.08	0.00	2.51	1.68	0.71	0.64	2.51	1.67	0.66	0.01	2.77	1.67	0.00	**180.43**
D10 Conveying	0.09	0.09	0.09	0.09	0.09	0.09	1.82	0.09	0.09	0.09	0.09	0.09	0.36	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	**8.39**
D20 Plumbing	0.02	0.03	0.05	0.02	0.14	0.02	0.02	0.09	0.02	0.02	0.04	0.03	0.02	0.02	0.14	0.03	0.02	0.09	0.02	0.02	0.02	0.02	0.08	0.02	0.14	**2.70**
D30 HVAC	1.44	1.92	11.03	4.00	1.53	1.51	1.32	1.26	2.67	1.27	1.51	1.26	12.44	1.24	1.21	1.42	1.95	1.43	1.26	1.49	2.31	1.29	11.10	1.59	2.42	**135.84**
D40 Fire Protection																										**0.00**
D50 Electrical	0.28	0.55	1.67	0.27	1.25	0.26	0.30	1.13	0.53	0.27	0.32	0.35	2.65	0.30	1.16	0.27	0.34	1.78	0.72	0.31	0.28	0.28	1.16	0.26	1.18	**35.18**
E10 Equipment	0.07	0.07	0.41	0.07	0.07	0.07	0.07	0.30	0.07	0.07	0.07	0.07	0.41	0.07	0.07	0.07	0.07	0.09	0.07	0.07	0.07	0.07	0.62	0.07	0.07	**6.14**
E20 Furnishings																										**0.00**
F10 Special Construction	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	1.87	2.57	1.87	1.87	1.87	**100.55**
F20 Selective Bldg Demolition																										**0.00**
G10 Site Preparation																										**0.00**
G20 Site Improvements																										**0.00**
G30 Site Mechanical Utilities																										**0.00**
G40 Site Electrical Utilities																										**0.00**
G90 Other Site Construction																										**0.00**
Total	**6.55**	**7.92**	**20.29**	**6.55**	**7.08**	**4.08**	**9.83**	**54.36**	**5.49**	**5.17**	**8.17**	**62.26**	**18.91**	**3.83**	**7.41**	**5.70**	**6.45**	**9.82**	**6.81**	**10.26**	**5.61**	**8.34**	**18.68**	**5.81**	**6.11**	**586.68**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 26-50

Based on a 50-Year Forecast.

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
B10 Super Structure																									
Replace Steel Roof Access Ladder							22,879																		
Repair Steel Roof Access Ladder																						6,665			
B20 Exterior Enclosure																									
Repair Steel, Exterior Door																									
Replace Steel Exterior Door, Sliding, Motor																	1,048								
Replace Steel Exterior Door, Sliding, Motor-Operated							36,581																		
Replace Steel Exterior Door, Swinging, Motor-Operated							12,193																		
Maintain Steel, 26'x20', Painted, Overhead Coiling Door, Motori	210	210	210	210	210	210	210	210	210	210	210	210		210	210	210	210	210	210	210	210	210	210	210	210
Repair Steel, 26'x20', Painted, Overhead Coiling Door, Motoriz								1,399															1,399		
Refinish Steel, 26'x20', Painted, Overhead Coiling Door, Motori								619															619		
Replace Steel, 26'x20', Painted, Overhead Coiling Door, Motori													26,105												
Finish Replaced Steel, 26'x20', Painted, Overhead Coiling Door													619												
Maintain Steel Exterior Door, Sliding, Motor	69	69	69	69	69	69		69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Replace Steel, Exterior Door Locks							4,190															4,190			
Maintain Steel Exterior Door, Swinging, Motor-Operated	23	23	23	23	23	23		23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Replace Steel, Exterior Door												11,556													
Maintain Steel, Painted, Exterior Double Door Locks		69					69										69					69			
Replace Steel, Painted, Exterior Double Door Locks							1,048															1,048			
Refinish Steel, Painted, Exterior Double Door							160															160			
Repair Steel, Painted, Exterior Double Door																									
Replace Steel, Painted, Exterior Double Door												6,450													
Finish Replaced Steel, Painted, Exterior Double Door												160													
Maintain Steel, Exterior Door Locks		275					275										275					275			
Finish Replaced Concrete, Painted, Exterior, Pre-Cast																									
Refinish Aluminum Louver, 1st Floor								188										188							
Replace Aluminum Louver, 1st Floor																									
Refinish Concrete Block, Painted, Exterior, 1st Floor	973										973										973				
Repair Concrete Block, Painted, Exterior, 1st Floor (2% of Wall																					229				
Repoint (50% surface) Concrete Block, Painted, Exterior, 1st Fl																					2,321				
Finish Repaired Concrete Block, Painted, Exterior, 1st Floor																					19				
Refinish Concrete, Painted, Exterior, Pre-Cast			38,398				72,324						38,398				72,324						38,398		
Replace Steel Exterior Door, Swinging, Motor-Operated																	349								
Replace Concrete, Painted, Exterior, Pre-Cast																									
Maintain Steel Exterior Door, Swinging, Motor-Operated	116	116	116	116	116	116		116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116
Finish Replaced Steel, Painted, Exterior, 1st Floor																									

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
B10 Super Structure																									
Replace Steel Roof Access Ladder																						22,879			
Repair Steel Roof Access Ladder												6,665													
B20 Exterior Enclosure																									
Repair Steel, Exterior Door		2,443															2,443								
Replace Steel Exterior Door, Sliding, Motor		1,048																				1,048			
Replace Steel Exterior Door, Sliding, Motor-Operated												36,581													
Replace Steel Exterior Door, Swinging, Motor-Operated												12,193													
Maintain Steel, 26'x20', Painted, Overhead Coiling Door, Moto	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210		210	210
Repair Steel, 26'x20', Painted, Overhead Coiling Door, Motori								1,399										1,399							
Refinish Steel, 26'x20', Painted, Overhead Coiling Door, Moto								619										619							
Replace Steel, 26'x20', Painted, Overhead Coiling Door, Moto																							26,105		
Finish Replaced Steel, 26'x20', Painted, Overhead Coiling Do																							619		
Maintain Steel Exterior Door, Sliding, Motor	69	69	69	69	69	69	69	69	69	69	69		69	69	69	69	69	69	69	69	69	69	69	69	69
Replace Steel, Exterior Door Locks							4,190										4,190								
Maintain Steel Exterior Door, Swinging, Motor-Operated	23	23	23	23	23	23	23	23	23	23	23		23	23	23	23	23	23	23	23	23	23	23	23	23
Replace Steel, Exterior Door																									
Maintain Steel, Painted, Exterior Double Door Locks		69					69					69					69					69			
Replace Steel, Painted, Exterior Double Door Locks							1,048										1,048								
Refinish Steel, Painted, Exterior Double Door							160										160								
Repair Steel, Painted, Exterior Double Door		1,142															1,142								
Replace Steel, Painted, Exterior Double Door																									
Finish Replaced Steel, Painted, Exterior Double Door																									
Maintain Steel, Exterior Door Locks		275					275					275					275					275			
Finish Replaced Concrete, Painted, Exterior, Pre-Cast												72,324													
Refinish Aluminum Louver, 1st Floor													188										188		
Replace Aluminum Louver, 1st Floor			1,853																						
Refinish Concrete Block, Painted, Exterior, 1st Floor						973										973									
Repair Concrete Block, Painted, Exterior, 1st Floor (2% of Wa																					229				
Repoint (50% surface) Concrete Block, Painted, Exterior, 1st																					2,321				
Finish Repaired Concrete Block, Painted, Exterior, 1st Floor																					19				
Refinish Concrete, Painted, Exterior, Pre-Cast		72,324						38,398										38,398				72,324			
Replace Steel Exterior Door, Swinging, Motor-Operated		349																				349			
Replace Concrete, Painted, Exterior, Pre-Cast												,905,885													
Maintain Steel Exterior Door, Swinging, Motor-Operated	116	116	116	116	116	116	116	116	116	116	116		116	116	116	116	116	116	116	116	116	116	116	116	116
Finish Replaced Steel, Painted, Exterior, 1st Floor			1,136																						

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Concrete, Painted, Exterior, Pre-Cast (2% of Walls)			10,275									19,355													
Maintain Steel Exterior Door, Sliding, Motor-Operated	346	346	346	346	346	346		346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346
Finish Repaired Concrete, Painted, Exterior, Pre-Cast			785									1,480													
Replace Steel, Insulated Wall Panels, Painted, Exterior, 2"																									
Finish Repaired Steel, Insulated Wall Panels, Painted, Exterior,			12																						
Repair Steel, Insulated Wall Panels, Painted, Exterior, 2" (2% o			285																						
Refinish Steel, Insulated Wall Panels, Painted, Exterior, 2"			613										613										613		
Replace Steel, Exterior, 1st Floor																									
Repair Steel, Exterior, 1st Floor (2% of Walls)			125																						

B30 Roofing

Replace Metal Roof							43,784																		
Replace Membrane, Single-Ply Modified Bituminous/Thermopla					172,063																				172,063
Repair Single-Ply Modified Bituminous/Thermoplastic Roof															47,299										
Maintain Single-Ply Modified Bituminous/Thermoplastic Roof	2,443	2,443	2,443	2,443		2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	
Minor Replacement, Metal Roof (2% of Roof)																									
Repair Metal Roof		923	66									989					989					989			
Replace Stainless Steel Gutter, Downspouts, Fittings																		29,526							
Replace Membrane, Built-up Roof													93,503												
Place New Membrane Over Existing, Built-up Roof																									
Maintain Stainless Steel Gutter, Downspouts, Fittings	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678		678	678	678	678	678	678	678
Non-Destructive Moisture Inspection, Built-up Roof			580					580										580					580		
Maintain Metal Roof	429	429	429	429	429	429		429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429
Maintain Built-up Roof	338	338	338	338	338	338	338	338	338	338	338	338		338	338	338	338	338	338	338	338	338	338	338	338
Non-Destructive Moisture Inspection			3,226							3,226					3,226					3,226					

C10 Interior Construction

Replace Steel, Painted, Interior Double Door												20,164													
Finish Replaced Steel, Painted, Interior Double Doors												620													
Refinish Steel, Painted, w/ Safety Glass Interior Door		31				31				31				31				31				31			
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks			23					23					23					23					23		
Replace Steel, Painted, w/ Safety Glass Interior Door Locks								334										334							
Finish Replaced Steel, Painted, w/ Safety Glass Interior Door																									
Refinish Steel, Painted, Interior Double Door	620				620				620							620				620				620	
Replace Steel, Painted, w/ Safety Glass Interior Door																									
Maintain Steel, Painted, Interior Double Door Locks		229					229										229					229			
Repair Steel, Vault Security, Interior Door																									
Finish Replaced Steel, Painted, Interior Door												64													

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Concrete, Painted, Exterior, Pre-Cast (2% of Walls)			10,275																						
Maintain Steel Exterior Door, Sliding, Motor-Operated	346	346	346	346	346	346	346	346	346	346	346		346	346	346	346	346	346	346	346	346	346	346	346	346
Finish Repaired Concrete, Painted, Exterior, Pre-Cast			785																						
Replace Steel, Insulated Wall Panels, Painted, Exterior, 2"								8,297																	
Finish Repaired Steel, Insulated Wall Panels, Painted, Exterio			12																						
Repair Steel, Insulated Wall Panels, Painted, Exterior, 2" (2%			285																						
Refinish Steel, Insulated Wall Panels, Painted, Exterior, 2"																		613							
Replace Steel, Exterior, 1st Floor			6,263																						
Repair Steel, Exterior, 1st Floor (2% of Walls)																									
B30 Roofing																									
Replace Metal Roof																						43,784			
Replace Membrane, Single-Ply Modified Bituminous/Thermopl																			172,063						
Repair Single-Ply Modified Bituminous/Thermoplastic Roof										47,299															
Maintain Single-Ply Modified Bituminous/Thermoplastic Roof	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443	2,443		2,443	2,443	2,443	2,443	2,443
Minor Replacement, Metal Roof (2% of Roof)		876																							
Repair Metal Roof		989					989					989					989								
Replace Stainless Steel Gutter, Downspouts, Fittings													29,526												
Replace Membrane, Built-up Roof																		93,503							
Place New Membrane Over Existing, Built-up Roof			44,229																						
Maintain Stainless Steel Gutter, Downspouts, Fittings	678	678	678	678	678	678	678	678	678	678	678	678		678	678	678	678	678	678	678	678	678	678	678	678
Non-Destructive Moisture Inspection, Built-up Roof			580					580					580										580		
Maintain Metal Roof	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429		429	429	429
Maintain Built-up Roof	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338		338	338	338	338	338	338	338
Non-Destructive Moisture Inspection					3,226					3,226					3,226										3,226
C10 Interior Construction																									
Replace Steel, Painted, Interior Double Door																									
Finish Replaced Steel, Painted, Interior Double Doors																									
Refinish Steel, Painted, w/ Safety Glass Interior Door	31				31							31				31				31				31	
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks			23										23					23					23		
Replace Steel, Painted, w/ Safety Glass Interior Door Locks			334															334							
Finish Replaced Steel, Painted, w/ Safety Glass Interior Door								31																	
Refinish Steel, Painted, Interior Double Door			620				620				620				620				620				620		
Replace Steel, Painted, w/ Safety Glass Interior Door								1,296																	
Maintain Steel, Painted, Interior Double Door Locks		229					229					229					229					229			
Repair Steel, Vault Security, Interior Door		384															384								
Finish Replaced Steel, Painted, Interior Door																									

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Steel, Painted, Interior Door												12,307													
Replace Steel, Painted, Interior Door Locks							667															667			
Maintain Steel, Painted, Interior Door Locks		45					45										45					45			
Refinish Steel, Vault Security, Interior Door	64				64				64							64				64				64	
Replace Steel, Painted, Interior Double Door Locks							3,339															3,339			
C20 Stairs																									
Finish Repaired Metal, Painted, Interior Railing						15		3				3									15				
Replace Metal, Painted, Interior Stairs												9,888													
Finish Repaired Metal, Painted, Interior Stairs						13		2													13		2		
Repair Metal, Painted, Interior Stairs						919		132													919		132		
Refinish Metal, Painted, Interior Stairs	312		63	437	312		63	437	312		63	437			63	750			63	750			63	750	
Finish Replaced Metal, Painted, Interior Stairs												312													
Repair Metal, Painted, Interior Railing						724		136				145									724				
Refinish Metal, Painted, Interior Railing	349		94	499	349		94	499	349		94	499	99			748	193			748	193			748	193
Replace Concrete, Interior Stairs												3,612													
Repair Concrete, Interior Stairs																									
Finish Replaced Metal, Painted, Interior Railing												249	94												
Replace Metal, Painted, Interior Railing												6,057	2,271												
C30 Interior Finishes																									
Repair Metal Floor Grating (2% of Grating)			377				309									1,400	309						377		
Repair Vinyl Tile Flooring (2% of Floors)			69							69					13						69				
Replace Steel Flooring												4,692													
Replace Concrete, Painted, Interior Wall Finish																									
Repair Steel Flooring (2% of Walls)								310																	
Replace Vinyl Tile Flooring	4,776					909						4,776						4,776						909	
Replace Fiberglass Floor Grating						22,141																			
Replace Concrete Ceiling												510,632													
Repair Fiberglass Floor Grating (2% of Grating)																11,448									
Replace Concrete Flooring												125,153													
Replace Metal Floor Grating						31,426							8,473												
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)						13									13										
Repair Concrete Ceiling (2% of Ceiling)								6,780																	
Refinish Metal, Painted Ceiling							3,623	6,710										6,710				3,623			
Repair Metal, Painted Ceiling (2% of Ceiling)								2,492																	
Finish Repaired Metal, Painted Ceiling								134																	
Replace Metal, Painted Ceiling												67,703													

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Steel, Painted, Interior Door																									
Replace Steel, Painted, Interior Door Locks							667										667								
Maintain Steel, Painted, Interior Door Locks		45					45					45					45					45			
Refinish Steel, Vault Security, Interior Door			64				64				64				64				64				64		
Replace Steel, Painted, Interior Double Door Locks							3,339										3,339								

C20 Stairs

Finish Repaired Metal, Painted, Interior Railing		11	3													15	8	3							
Replace Metal, Painted, Interior Stairs													1,977												
Finish Repaired Metal, Painted, Interior Stairs		9									13						9								
Repair Metal, Painted, Interior Stairs		657									919						657								
Refinish Metal, Painted, Interior Stairs		63	750			63	750			63	750				750		63		750		63		750		63
Finish Replaced Metal, Painted, Interior Stairs													63												
Repair Metal, Painted, Interior Railing		507	136													724	362	136							
Refinish Metal, Painted, Interior Railing			249	193	499		249	193	499		249	94	499		249	193	499		249	193	499		249	193	499
Replace Concrete, Interior Stairs																									
Repair Concrete, Interior Stairs							283																		
Finish Replaced Metal, Painted, Interior Railing	499											99													
Replace Metal, Painted, Interior Railing	12,112											2,422													

C30 Interior Finishes

Repair Metal Floor Grating (2% of Grating)	1,400							377				309									1,400	309			
Repair Vinyl Tile Flooring (2% of Floors)			69					13						69							69				
Replace Steel Flooring								4,816																	
Replace Concrete, Painted, Interior Wall Finish								108,307																	
Repair Steel Flooring (2% of Walls)												302													
Replace Vinyl Tile Flooring					4,776							4,776					909						4,776		
Replace Fiberglass Floor Grating											22,141														
Replace Concrete Ceiling								340,420																	
Repair Fiberglass Floor Grating (2% of Grating)	11,448																				11,448				
Replace Concrete Flooring								187,729																	
Replace Metal Floor Grating		6,933									31,426							8,473							
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)							13									13									13
Repair Concrete Ceiling (2% of Ceiling)												10,170													
Refinish Metal, Painted Ceiling			6,710				3,623										3,623	6,710							
Repair Metal, Painted Ceiling (2% of Ceiling)												1,346													
Finish Repaired Metal, Painted Ceiling												72													
Replace Metal, Painted Ceiling								125,376																	

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Finish Replaced Metal, Painted Ceiling												3,623													
Repair Fiberglass Paneling (2% of Ceiling)						81															81				
Replace Fiberglass Paneling											4,035														
Repair Concrete Flooring (2% of Floors)			3,754															3,754							
Replace Acoustical Tile, Dropped Ceiling																							651		
Repoint (50% surface) Concrete Block, Painted, Interior Wall Fi			1,564										1,877												
Finish Replaced Steel, Painted, Interior Wall Finish												38,055													
Repair Fiberglass Paneling (2% of Walls)						139															139				
Repair Concrete Block, Painted, Interior Wall Finish (2% of Wal			132										158												
Finish Repaired Concrete Block, Painted, Interior Wall Finish			10										12												
Replace Concrete Block, Painted, Interior Wall Finish																									
Finish Replaced Concrete Block, Painted, Interior Wall Finish																									
Clean & Seal Concrete, Interior Wall Finish	62,694	41,796			62,694	41,796			62,694	41,796				41,796		62,694		41,796		62,694		41,796		62,694	
Repair Concrete, Interior Wall Finish (2% of Walls)								17,727																	
Replace Concrete, Interior Wall Finish												,343,005													
Refinish Concrete, Painted, Interior Wall Finish								4,166										4,166							
Repair Steel, Painted, Interior Wall Finish (2% of Walls)	384							2,215																	
Finish Repaired Concrete, Painted, Interior Wall Finish								83																	
Replace Steel, Painted, Interior Wall Finish												472,718													
Finish Replaced Concrete, Painted, Interior Wall Finish																									
Replace Fiberglass Paneling											6,917														
Repair Steel, Interior Wall Finish (2% of Walls)																									
Refinish Steel, Painted, Interior Wall Finish						794	19,382	4,571								794		4,571				19,382			
Refinish Concrete Block, Painted, Interior Wall Finish			505					606					505					606					505		
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)								2,145																	
Finish Repaired Steel, Painted, Interior Wall Finish	16							91																	
D10 Conveying																									
Maintain Wheel Chair Lift, Vertical	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517		1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
Replace Bridge Crane, Overhead, 3 Ton							66,146																		
Maintain Bridge Crane, Overhead, 3 Ton	1,082	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Replace Wheel Chair Lift, Vertical													12,222												
D20 Plumbing																									
Maintain Backflow Preventer, 4"	249	249	249	249	249	249	249	249	249		249	249	249	249	249	249	249	249	249		249	249	249	249	249
Re-tape Pipe Insulation, Fiberglass, Hot Water								28					28					28					28		
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insula			95																						
Replace 10' Section, Pipe & Fittings, 3" Cast Iron									319															319	

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Finish Replaced Metal, Painted Ceiling								6,710																	
Repair Fiberglass Paneling (2% of Ceiling)						81										81									
Replace Fiberglass Paneling																					4,035				
Repair Concrete Flooring (2% of Floors)		2,503															2,503						3,754		
Replace Acoustical Tile, Dropped Ceiling																									
Repoint (50% surface) Concrete Block, Painted, Interior Wall													1,877												
Finish Replaced Steel, Painted, Interior Wall Finish								8,975																	
Repair Fiberglass Paneling (2% of Walls)						139										139									
Repair Concrete Block, Painted, Interior Wall Finish (2% of W													158												
Finish Repaired Concrete Block, Painted, Interior Wall Finish													12												
Replace Concrete Block, Painted, Interior Wall Finish			6,587																						
Finish Replaced Concrete Block, Painted, Interior Wall Finish			505																						
Clean & Seal Concrete, Interior Wall Finish	41,796		62,694		41,796		62,694				62,694	41,796			62,694	41,796			62,694	41,796			62,694	41,796	
Repair Concrete, Interior Wall Finish (2% of Walls)												26,591													
Replace Concrete, Interior Wall Finish								895,336																	
Refinish Concrete, Painted, Interior Wall Finish			4,166															4,166							
Repair Steel, Painted, Interior Wall Finish (2% of Walls)	384											9,394													
Finish Repaired Concrete, Painted, Interior Wall Finish																									
Replace Steel, Painted, Interior Wall Finish								111,484																	
Finish Replaced Concrete, Painted, Interior Wall Finish								4,166																	
Replace Fiberglass Paneling																					6,917				
Repair Steel, Interior Wall Finish (2% of Walls)	6,017																								
Refinish Steel, Painted, Interior Wall Finish	794		4,571				19,382				794						19,382	4,571			794				
Refinish Concrete Block, Painted, Interior Wall Finish			606										1,111										1,111		
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)																									
Finish Repaired Steel, Painted, Interior Wall Finish	16											388													

D10 Conveying

Maintain Wheel Chair Lift, Vertical	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517		1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
Replace Bridge Crane, Overhead, 3 Ton							66,146																		
Maintain Bridge Crane, Overhead, 3 Ton	1,082	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Replace Wheel Chair Lift, Vertical													12,222												

D20 Plumbing

Maintain Backflow Preventer, 4"	249	249	249	249		249	249	249	249	249	249	249	249	249		249	249	249	249	249	249	249	249	249	
Re-tape Pipe Insulation, Fiberglass, Hot Water								28					28					28					28		
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insul			95																						
Replace 10' Section, Pipe & Fittings, 3" Cast Iron											319												319		

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insulati			95																						
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)												6,371													
Replace 10' Section, Pipe & Fittings, 4" Cast Iron									260															260	
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron																									
Replace Pipe & Fittings, 4" Cast Iron (20% of Pipe)												5,209													
Install New Gasket & Bolts, Pipe & Fittings, 6" Cast Iron																									
Re-tape Pipe Insulation, Fiberglass, Cold Water								28					28					28					28		
Replace Backflow Preventer, 4"										5,259										5,259					
Replace Pipe & Fittings, 6" Cast Iron (20% of Pipe)												4,614													
Replace 10' Section, Pipe & Fittings, 6" Cast Iron									231															231	
Replace Washer & Spud Connection, Lavatory, Vitreous China						46														46					
Replace Pipe & Fittings, 3/4" Copper, Hot Water (20% of Pipe)			508																						
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron																									
Replace Coolant & Adjust Water Cooler, Electric	68				68		68		68		68				68		68		68		68				68
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chin		29		29		29		29		29		29			29		29		29		29		29		29
Replace Valve Set, Lavatory, Vitreous China								148															148		
Replace Lavatory, Vitreous China													502												
Replace Tankless Water Closet													691												
Resolder Joint, Pipe & Fittings, 3/4" Copper, Cold Water													51										51		
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Hot Water																							25		
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Cold Water																							25		
Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pipe			508																						
Replace Flush Valve, Tankless Water Closet								29															29		
Resolder Joint, Pipe & Fittings, 3/4" Copper, Hot Water													51										51		
Replace Water Cooler, Electric			2,543										2,543										2,543		

D30 HVAC

Repair Condensate Receiver Station, Motor, 10-15 Gal.			1,969								1,969				1,969								1,969		
Replace 10' Section, Pipe & Fittings, 1" Steel									229															229	
Replace Pipe & Fittings, 2" Steel (20% of Pipe)												7,703													
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel																									
Replace Condensate Receiver Station, 10-15 Gal.							6,956											6,956							
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel																									
Lubricate, Repack Gland, Butterfly Valve, 18"	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
Replace 10' Section, Pipe & Fittings, 2" Steel									386															386	
Replace Pipe & Fittings, 1" Steel (20% of Pipe)												4,577													
Maintain Steam Trap, F&T, 1"	307	307	307		307	307	307	307	307	307	307		307	307	307	307	307	307	307		307	307	307	307	307
Maintain Steam Trap, F&T, 2"		176	176	176	176	176	176	176		176	176	176	176	176	176	176		176	176	176	176	176	176	176	

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insula			95																						
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 4" Cast Iron											260												260		
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron												84													
Replace Pipe & Fittings, 4" Cast Iron (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 6" Cast Iron												62													
Re-tape Pipe Insulation, Fiberglass, Cold Water								28					28					28					28		
Replace Backflow Preventer, 4"					5,259										5,259										5,259
Replace Pipe & Fittings, 6" Cast Iron (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 6" Cast Iron											231												231		
Replace Washer & Spud Connection, Lavatory, Vitreous Chin		46							46							46									
Replace Pipe & Fittings, 3/4" Copper, Hot Water (20% of Pipe			508																						
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron												130													
Replace Coolant & Adjust Water Cooler, Electric		68		68		68				68		68		68		68				68		68		68	
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chi		29		29		29		29		29		29		29		29		29		29		29			29
Replace Valve Set, Lavatory, Vitreous China								148										148							
Replace Lavatory, Vitreous China																							502		
Replace Tankless Water Closet																							691		
Resolder Joint, Pipe & Fittings, 3/4" Copper, Cold Water													51										51		
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Hot Water																							25		
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Cold Water																							25		
Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pip			508																						
Replace Flush Valve, Tankless Water Closet								29										29							
Resolder Joint, Pipe & Fittings, 3/4" Copper, Hot Water													51										51		
Replace Water Cooler, Electric								2,543										2,543							

D30 HVAC

Repair Condensate Receiver Station, Motor, 10-15 Gal.		1,969								1,969				1,969								1,969			
Replace 10' Section, Pipe & Fittings, 1" Steel											229												229		
Replace Pipe & Fittings, 2" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel												230													
Replace Condensate Receiver Station, 10-15 Gal.						6,956												6,956							
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel												183													
Lubricate, Repack Gland, Butterfly Valve, 18"	63	63	63	63	63	63	63	63	63	63		63	63	63	63	63	63	63	63	63	63	63	63	63	63
Replace 10' Section, Pipe & Fittings, 2" Steel											386												386		
Replace Pipe & Fittings, 1" Steel (20% of Pipe)																									
Maintain Steam Trap, F&T, 1"	307	307		307	307	307	307	307	307	307		307	307	307	307	307	307	307		307	307	307	307	307	307
Maintain Steam Trap, F&T, 2"	176	176	176	176	176	176	176		176	176	176	176	176	176	176		176	176	176	176	176	176	176		176

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Steam Trap, F&T, 1"		2,970				2,970		2,970		2,970				2,970		2,970		2,970				2,970		2,970	
Repair Steam Trap, F&T, 2"			1,697		1,697		1,697				1,697		1,697		1,697				1,697		1,697		1,697		
Repair Condensate Receiver Station, 10-15 Gal.	523		523		523				523		523		523		523		523				523		523		523
Replace Steam Trap, F&T, 2"	3,894								3,894								3,894								3,894
Replace Pipe & Fittings, 4" Steel, Gas (20% of Pipe)																							10,189		
Replace 10' Section, Pipe & Fittings, 18" Steel		624												624											
Replace Steam Trap, F&T, 1"				2,584								2,584								2,584					
Replace 10' Section, Pipe & Fittings, 4" Steel, Gas								510												510					
Maintain Flow Control Valve & Actuator, 2"	432	432	432	432	432	432	432	432	432	432	432	432	432		432	432	432	432	432	432	432	432	432	432	432
Lubricate, Repack Gland, Ball Valve, 2"	205	205	205	205	205	205	205	205	205	205		205	205	205	205	205	205	205	205	205	205	205	205	205	205
Replace Ball Valve, 2"											1,231														
Lubricate, Repack Gland, Ball Valve, 4"	205	205	205	205	205	205	205	205	205	205		205	205	205	205	205	205	205	205	205	205	205	205	205	205
Replace Ball Valve, 4"											2,155														
Replace 10' Section, Pipe & Fittings, 2" Steel, Gas								116												116					
Replace Pressurized Tank, 250 Gal.							109,197																		
Replace Pipe & Fittings, 2" Steel, Gas (20% of Pipe)																							2,311		
Maintain Condensate Receiver Station, 10-15 Gal.	87	87	87	87	87	87		87	87	87	87	87	87	87	87	87	87	87		87	87	87	87	87	87
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel, Gas																									
Maintain Pressurized Tank, 250 Gal.	753	753	753	753	753	753		753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753
Maintain Flow Control Valve & Actuator, 4"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216		216	216	216	216	216	216	216	216
Replace Valve Actuator, 4"													4,120												
Replace Flow Control Valve, Motorized, 4"																	6,913								
Maintain Pressure Reducer Valve, 4"		29	29	29	29		29	29	29	29		29	29	29	29		29	29	29	29		29	29	29	29
Replace Pressure Reducer Valve, 4"	3,089					3,089					3,089					3,089					3,089				
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel, Gas																									
Replace Exhaust Fan, Double Width, Double Inlet Airfoil, 1,000								4,023															4,023		
Replace Existing Ductwork (20% of Ductwork)				2,254															3,380						
Replace Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton																									25,686
Maintain Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	
Replace Steel Damper, Motorized, w/ Actuator			2,111																				2,111		
Refinish Steel Damper, Motorized, w/ Actuator													140												
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Actu								60					60					60							
Replace Exhaust Fan, Propeller, 800 Cfm											1,068														
Replace Fan Coil, Two-Pipe, 800 Cfm																	10,057								
Maintain Exhaust Fan, Propeller, 800 Cfm	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123	123
Maintain Unit Heater, 12 Mbh	646	646	646	646	646	646	646	646	646	646	646		646	646	646	646	646	646	646	646	646	646	646	646	646
Repair Exhaust Fan, Double Width, Double Inlet Airfoil, 1,000					791												791								

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Steam Trap, F&T, 1"	2,970				2,970		2,970		2,970				2,970		2,970		2,970				2,970		2,970		2,970
Repair Steam Trap, F&T, 2"		1,697		1,697		1,697				1,697		1,697		1,697				1,697		1,697		1,697			
Repair Condensate Receiver Station, 10-15 Gal.		523		523				523		523		523		523		523				523		523		523	
Replace Steam Trap, F&T, 2"								3,894								3,894								3,894	
Replace Pipe & Fittings, 4" Steel, Gas (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 18" Steel	624												624												624
Replace Steam Trap, F&T, 1"			2,584								2,584								2,584						
Replace 10' Section, Pipe & Fittings, 4" Steel, Gas										510												510			
Maintain Flow Control Valve & Actuator, 2"	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	
Lubricate, Repack Gland, Ball Valve, 2"		205	205	205	205	205	205	205	205	205	205	205	205	205	205		205	205	205	205	205	205	205	205	205
Replace Ball Valve, 2"	1,231															1,231									
Lubricate, Repack Gland, Ball Valve, 4"		205	205	205	205	205	205	205	205	205	205	205	205	205	205		205	205	205	205	205	205	205	205	205
Replace Ball Valve, 4"	2,155															2,155									
Replace 10' Section, Pipe & Fittings, 2" Steel, Gas										116												116			
Replace Pressurized Tank, 250 Gal.																									
Replace Pipe & Fittings, 2" Steel, Gas (20% of Pipe)																									
Maintain Condensate Receiver Station, 10-15 Gal.	87	87	87	87	87		87	87	87	87	87	87	87	87	87	87	87		87	87	87	87	87	87	87
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel, Gas																							244		
Maintain Pressurized Tank, 250 Gal.	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753	753
Maintain Flow Control Valve & Actuator, 4"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
Replace Valve Actuator, 4"																								4,120	
Replace Flow Control Valve, Motorized, 4"																									
Maintain Pressure Reducer Valve, 4"		29	29	29	29		29	29	29	29		29	29	29	29		29	29	29	29		29	29	29	29
Replace Pressure Reducer Valve, 4"	3,089					3,089					3,089					3,089					3,089				
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel, Gas																							69		
Replace Exhaust Fan, Double Width, Double Inlet Airfoil, 1,00													4,023												
Replace Existing Ductwork (20% of Ductwork)					2,254															3,380					
Replace Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton																									
Maintain Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293	1,293
Replace Steel Damper, Motorized, w/ Actuator																		2,111							
Refinish Steel Damper, Motorized, w/ Actuator								140																	
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Act			60					60					60										60		
Replace Exhaust Fan, Propeller, 800 Cfm	1,068															1,068									
Replace Fan Coil, Two-Pipe, 800 Cfm																								10,057	
Maintain Exhaust Fan, Propeller, 800 Cfm		123	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123
Maintain Unit Heater, 12 Mbh	646	646	646	646	646	646	646	646	646	646	646	646	646	646	646	646	646	646		646	646	646	646	646	646
Repair Exhaust Fan, Double Width, Double Inlet Airfoil, 1,000							791															791			

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Maintain Exhaust Fan, Double Width, Double Inlet Airfoil, 1,000	380	380	380	380	380	380	380		380	380	380	380	380	380	380	380	380	380	380	380	380	380		380	380
Replace Exhaust Fan, Centrifugal, 2,000 Cfm								2,041															2,041		
Repair Exhaust Fan, Centrifugal, 2,000 Cfm					264												264								
Maintain Exhaust Fan, Centrifugal, 2,000 Cfm	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123
Replace Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm								863															863		
Maintain Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm	66	66	66	66	66	66	66		66	66	66	66	66	66	66	66	66	66	66	66	66	66		66	66
Repair Exhaust Fan, Propeller, 800 Cfm								264												264					
Replace Unit Heater, 36 Mbh																									
Install New Gasket & Bolts, Pipe & Fittings, 18" Steel			51																						
Replace Butterfly Valve, 18"																									
Replace Thermostat						1,615		1,615								1,615		1,615							
Maintain Thermostat	231	231	231	231	231	116	231	116	231	231	231	231	231	231	231	116	231	116	231	231	231	231	231	231	231
Inspect and Test Meter, Natural Gas, w/ Digital Pulser, 400 Chf	29	29	29	29	29		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Replace Meter, Natural Gas, w/ Digital Pulser, 400 Chf						766																			
Replace Pressure Switch				903										903										903	
Repair Fan Coil, Two-Pipe, 800 Cfm													1,683												
Monitor Direct Digital Controls, System Points	16,392	16,392	16,392	16,392	16,392	16,392	16,392		16,392	16,392	16,392	16,392	16,392	16,392	16,392	16,392	16,392		16,392	16,392	16,392	16,392	16,392	16,392	16,392
Repair Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton													7,722												
Repair Unit Heater, 36 Mbh								675																	
Maintain Unit Heater, 36 Mbh	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
Replace Unit Heater, 480v, 10kW										3,106															
Replace Unit Heater, 12 Mbh												3,045													
Repair Unit Heater, 480v, 5kW																									
Repair Unit Heater, 12 Mbh								2,123																	
Maintain Unit Heater, 480v, 5kW	484	484	484	484	484	484	484	484	484		484	484	484	484	484	484	484	484	484	484	484	484	484	484	484
Replace Direct Digital Controls, System Points								394,109										394,109							
Replace Flow Control Valve, Motorized, 8"														29,208											
Replace Pipe & Fittings, 1" Steel (20% of Pipe)												3,813													
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel																									
Replace 10' Section, Pipe & Fittings, 1" Steel									191															191	
Replace Flow Control Valve, Motorized, 20"																									
Replace Flow Control Valve, Motorized, 12"																									
Replace Valve Actuator, 12"																									18,673
Replace Actuator, Flow Control Valve, Motorized, 20"																									9,337
Replace 10' Section, Pipe & Fittings, 2" Steel									129															129	
Maintain Flow Control Valve & Actuator, 12"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
Maintain Flow Control Valve & Actuator, 6"	324	324	324	324	324	324	324	324	324	324	324	324	324	108	324	324	324	324	324	324	324	324	324	324	324

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Maintain Exhaust Fan, Double Width, Double Inlet Airfoil, 1,00	380	380	380	380	380	380	380	380	380	380	380	380		380	380	380	380	380	380	380	380	380	380	380	380
Replace Exhaust Fan, Centrifugal, 2,000 Cfm													2,041												
Repair Exhaust Fan, Centrifugal, 2,000 Cfm							264															264			
Maintain Exhaust Fan, Centrifugal, 2,000 Cfm	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123
Replace Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm													863												
Maintain Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm	66	66	66	66	66	66	66	66	66	66	66	66		66	66	66	66	66	66	66	66	66	66	66	66
Repair Exhaust Fan, Propeller, 800 Cfm										264															264
Replace Unit Heater, 36 Mbh							1,264																		
Install New Gasket & Bolts, Pipe & Fittings, 18" Steel			51																						
Replace Butterfly Valve, 18"											5,897														
Replace Thermostat	1,615		1,615								1,615		1,615								1,615		1,615		
Maintain Thermostat	116	231	116	231	231	231	231	231	231	231	116	231	116	231	231	231	231	231	231	231	116	231	116	231	231
Inspect and Test Meter, Natural Gas, w/ Digital Pulser, 400 Ch	29	29	29	29	29		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Replace Meter, Natural Gas, w/ Digital Pulser, 400 Chf						766																			
Replace Pressure Switch									903										903						
Repair Fan Coil, Two-Pipe, 800 Cfm												1,683													
Monitor Direct Digital Controls, System Points	16,392	16,392		16,392	16,392	16,392	16,392	16,392	16,392	16,392	16,392	16,392		16,392	16,392	16,392	16,392	16,392	16,392	16,392	16,392	16,392		16,392	16,392
Repair Air Conditioner, Rooftop, Single Zone, 7-1/2 Ton																				7,722					
Repair Unit Heater, 36 Mbh			675																						
Maintain Unit Heater, 36 Mbh	161	161	161	161	161	161		161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
Replace Unit Heater, 480v, 10kW																	3,106								
Replace Unit Heater, 12 Mbh																			3,045						
Repair Unit Heater, 480v, 5kW					505																				
Repair Unit Heater, 12 Mbh							2,123																		
Maintain Unit Heater, 480v, 5kW	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484		484	484	484	484	484	484	484	484
Replace Direct Digital Controls, System Points			394,109										394,109										394,109		
Replace Flow Control Valve, Motorized, 8"																									29,208
Replace Pipe & Fittings, 1" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel												152													
Replace 10' Section, Pipe & Fittings, 1" Steel											191												191		
Replace Flow Control Valve, Motorized, 20"				53,807					53,807																
Replace Flow Control Valve, Motorized, 12"				46,735																					
Replace Valve Actuator, 12"																									
Replace Actuator, Flow Control Valve, Motorized, 20"					9,337																				
Replace 10' Section, Pipe & Fittings, 2" Steel											129												129		
Maintain Flow Control Valve & Actuator, 12"	216	216	216		216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
Maintain Flow Control Valve & Actuator, 6"	324	324	324	216	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	108

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Valve Actuator, 8"										20,175															
Maintain Flow Control Valve & Actuator, 8"	432	432	432	432	432	432	432	432	432	432	432	432	432		432	432	432	432	432	432	432	432	432	432	432
Replace Flow Control Valve, Motorized, 6"														10,112											
Replace Valve Actuator, 6"										9,789															4,895
Replace Strainer, Cast Iron, 20"												25,634													
Replace Flow Control Valve, Motorized, 2"														6,953											
Maintain Fan Coil, Two-Pipe, 800 Cfm	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689		689	689	689	689	689	689	689	689
Replace Valve Actuator, 2"										4,764															
Maintain Flow Control Valve, Motorized, 20"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
Replace Gate Valve, 2-3"																1,162									
Maintain Strainer, Cast Iron, 20"	114	114	114	114	114	114	114	114	114	114	114		114	114	114	114	114	114	114	114	114	114	114	114	114
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel																									
Repack Gland, Gate Valve, 8"		756														756									
Repack Gland, Gate Valve, 2-3"									126															126	
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of Ins													1,913												
Re-tape Pipe Insulation, Fiberglass, Chilled Water			567					567										567					567		
Replace Pipe & Fittings, 12" Steel (20% of Pipe)												7,914													
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel																									
Replace 10' Section, Pipe & Fittings, 12" Steel									395															395	
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel																									
Replace 10' Section, Pipe & Fittings, 6" Steel									509															509	
Replace Pipe & Fittings, 4" Steel (20% of Pipe)												4,585													
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel																									
Replace 10' Section, Pipe & Fittings, 4" Steel									229															229	
Replace Gate Valve, 8"								44,439															44,439		
Replace Pipe & Fittings, 2" Steel (20% of Pipe)												2,567													
Replace Pipe & Fittings, 6" Steel (20% of Pipe)												10,248													

D50 Electrical

Replace Metal Halide Lighting Fixture, Wall Mount, 150 w			22,826																				22,826		
Replace Incandescent Lighting Fixture, EP, 200 w																	2,658								
Annual PM, Grounding System	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259		259	259	259	259	259	259	259
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150								4,630					4,630					4,630							
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 150													9,128												
Replace Ballast & Lamp, Halogen Lighting Fixture, 250 w								573					10,332												
Maintain Camera, Interior, Closed Circuit, PTZ Color	997	997	997	997	997	997	997	997	997		997	997	997	997	997	997	997	997	997		997	997	997	997	997
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 2-								5,419					2,710												
Replace Lamp, Incandescent Lighting Fixture, EP, 200 w		22					22					22										22			

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Valve Actuator, 8"																					20,175				
Maintain Flow Control Valve & Actuator, 8"	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	
Replace Flow Control Valve, Motorized, 6"				5,055																					10,112
Replace Valve Actuator, 6"																					9,789				
Replace Strainer, Cast Iron, 20"		25,634															25,634								
Replace Flow Control Valve, Motorized, 2"																									6,953
Maintain Fan Coil, Two-Pipe, 800 Cfm	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689	689		689
Replace Valve Actuator, 2"																					4,764				
Maintain Flow Control Valve, Motorized, 20"	216	216	216	108	216	216	216	216	108	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
Replace Gate Valve, 2-3"						1,162															1,162				
Maintain Strainer, Cast Iron, 20"	114		114	114	114	114	114	114	114	114	114	114	114	114	114	114		114	114	114	114	114	114	114	114
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel												77													
Repack Gland, Gate Valve, 8"						756															756				
Repack Gland, Gate Valve, 2-3"														126											
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of In													1,913												
Re-tape Pipe Insulation, Fiberglass, Chilled Water			567					567										567					567		
Replace Pipe & Fittings, 12" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel												83													
Replace 10' Section, Pipe & Fittings, 12" Steel											395												395		
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel												261													
Replace 10' Section, Pipe & Fittings, 6" Steel											509												509		
Replace Pipe & Fittings, 4" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel												109													
Replace 10' Section, Pipe & Fittings, 4" Steel											229												229		
Replace Gate Valve, 8"													44,439												
Replace Pipe & Fittings, 2" Steel (20% of Pipe)																									
Replace Pipe & Fittings, 6" Steel (20% of Pipe)																									

D50 Electrical

Replace Metal Halide Lighting Fixture, Wall Mount, 150 w																		22,826							
Replace Incandescent Lighting Fixture, EP, 200 w												2,658													
Annual PM, Grounding System	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259		259	259	259	259	259	259	259
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150			4,630					4,630					4,630										4,630		
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 15								9,128																	
Replace Ballast & Lamp, Halogen Lighting Fixture, 250 w			573					10,332															573		
Maintain Camera, Interior, Closed Circuit, PTZ Color	997	997	997	997		997	997	997	997	997	997	997	997	997		997	997	997	997	997	997	997	997	997	
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 2			5,419					2,710															5,419		
Replace Lamp, Incandescent Lighting Fixture, EP, 200 w		22					22										22					22			

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Incandescent Lighting Fixture, Basic, 100 w								778										4,511							
Replace Halogen Lighting Fixture, 250 w			18,201															1,011					18,201		
Replace Fluorescent Lighting Fixture, T12, 4-60 w																		1,746							
Replace Fluorescent Lighting Fixture, T12, 2-60 w			4,464															8,927					4,464		
Replace Camera, Interior, Closed Circuit, PTZ Color										35,047										35,047					
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 4-								1,061																	
Replace Public Address Speaker			2,011															2,011							
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w			418					356					418					62					418		
Maintain Public Address Speaker	179	179		179	179	179	179	179	179	179	179	179	179	179	179	179	179		179	179	179	179	179	179	179
Replace Fluorescent Lighting Fixture, T8, 2-32 w								1,164						388											
Repair Power Panel Board, 208 Y/120 V, 225 Amp.				143														713						143	
Maintain & Repair, Grounding System	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256		256	256	256	256	256	256	256
Maintain & Repair General Wiring, Lightning Protection System	214	214		214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214
Inspect and Test Meter, Electrical, 208 Volt, 400 Amp.	90	90	90	90	90	90	90		90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Replace Meter, Electrical, 208 Volt, 400 Amp.								1,321																	
Replace Smoke Detector													352												
Replace Manual Pull Station								151															151		
Replace Batteries & Check Operation, Smoke Detector	48	48	48	48	48	48	48	48	48	48	48	48		48	48	48	48	48	48	48	48	48	48	48	48
Maintain Card Reader w/ Keypad	272	272	272		272	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272		272
Replace Lightning Protection General Wiring			21,709															10,300							
Check & Repair Manual Pull Station																		64							
Replace Intrusion Detection Motion Detector, Interior				3,484										3,484										3,484	
Maintain Intrusion Detection Motion Detector, Interior	227	227	227		227	227	227	227	227	227	227	227	227		227	227	227	227	227	227	227	227	227		227
Replace Fire Alarm Horn & Strobe																		532							
Replace Electric Lock				982										982										982	
Replace Access Card Reader w/ Keypad				3,735										3,735										3,735	
Repair Smoke Detector			120																				120		
Repair Disconnect Switch, 100 Amp.								1,079										863							
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272
Replace Motor Starter, 5-20 HP, <600 V												2,579		860											
Replace Coil, Motor Starter, 5-20 HP, <600 V		264	789		264	789		264	789		264				789		264	789		264	789		264	789	
Inspect & Clean Motor Starter, 5-20 HP, <600 V	243	243	243	243	243	243	243	243	243	243	243	60	243	183	243	243	243	243	243	243	243	243	243	243	243
Replace Motor Starter, <5HP, <600V						1,405			703															1,405	
Replace Coil, Motor Starter, <5HP, <600V			789			264			526			789			789			789			789			264	
Repair Power Panel Board, 208 Y/120 V, 100 Amp.																		428							
Replace Disconnect Switch, 100 Amp.																		1,476							
Maintain Disconnect Switch, 60 Amp.	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Incandescent Lighting Fixture, Basic, 100 w			778										4,511										778		
Replace Halogen Lighting Fixture, 250 w													1,011					18,201							
Replace Fluorescent Lighting Fixture, T12, 4-60 w													1,746												
Replace Fluorescent Lighting Fixture, T12, 2-60 w													8,927					4,464							
Replace Camera, Interior, Closed Circuit, PTZ Color					35,047										35,047										35,047
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 4			1,061																				1,061		
Replace Public Address Speaker								2,011															2,011		
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w			356					418					62					418					356		
Maintain Public Address Speaker	179	179	179	179	179	179	179		179	179	179	179	179	179	179	179	179	179	179	179	179	179		179	179
Replace Fluorescent Lighting Fixture, T8, 2-32 w			1,164						388														1,164		
Repair Power Panel Board, 208 Y/120 V, 225 Amp.			713						143														713		
Maintain & Repair, Grounding System	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256		256	256	256	256	256	256	256
Maintain & Repair General Wiring, Lightning Protection Syste	214	214		214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214
Inspect and Test Meter, Electrical, 208 Volt, 400 Amp.	90	90	90	90	90	90	90	90	90	90	90	90		90	90	90	90	90	90	90	90	90	90	90	90
Replace Meter, Electrical, 208 Volt, 400 Amp.													1,321												
Replace Smoke Detector			352															352							
Replace Manual Pull Station													151												
Replace Batteries & Check Operation, Smoke Detector	48	48		48	48	48	48	48	48	48	48	48	48	48	48	48	48		48	48	48	48	48	48	48
Maintain Card Reader w/ Keypad	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272		272	272	272	272	272	272
Replace Lightning Protection General Wiring			21,709															10,300							
Check & Repair Manual Pull Station								64															64		
Replace Intrusion Detection Motion Detector, Interior									3,484										3,484						
Maintain Intrusion Detection Motion Detector, Interior	227	227	227	227	227	227	227	227		227	227	227	227	227	227	227	227	227		227	227	227	227	227	227
Replace Fire Alarm Horn & Strobe													532												
Replace Electric Lock									982										982						
Replace Access Card Reader w/ Keypad									3,735										3,735						
Repair Smoke Detector													120												
Repair Disconnect Switch, 100 Amp.			216										1,079										1,079		
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	272	272	272	272	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272	272	272	272
Replace Motor Starter, 5-20 HP, <600 V					2,579		860																2,579		860
Replace Coil, Motor Starter, 5-20 HP, <600 V	264	789		264				789		264	789		264	789		264	789		264	789		264			
Inspect & Clean Motor Starter, 5-20 HP, <600 V	243	243	243	243	60	243	183	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	60	243	183
Replace Motor Starter, <5HP, <600V		703															1,405			703					
Replace Coil, Motor Starter, <5HP, <600V		526			789			789			789			789			264			526			789		
Repair Power Panel Board, 208 Y/120 V, 100 Amp.			428																				428		
Replace Disconnect Switch, 100 Amp.			5,907																						
Maintain Disconnect Switch, 60 Amp.	90	90		90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Maintain Disconnect Switch, 100 Amp.	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	337	421	421	421	421	421	421	421
Replace Disconnect Switch, 60 Amp.																									
Repair Disconnect Switch, 60 Amp.								570										570							
Replace Disconnect Switch, 30 Amp.																									
Maintain Disconnect Switch, 30 Amp.	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-3				247														743						247	
Maintain Power Panel Board, 480 V, 200 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Inspect & Clean Motor Starter, <5HP, <600V	181	181	181	181	181	60	181	181	121	181	181	181	181	181	181	181	181	181	181	181	181	181	181	60	181
Repair Secondary Transformer, Dry, 45 kVA																		327							
Replace Power Panel Board, 208 Y/120 V, 100 Amp.								13,747																	
Replace Exit Lighting Fixture, LED														660											
Repair Disconnect Switch, 30 Amp.				933			374	2,240						933			374	2,240						933	
Replace Emergency Lighting Pack, 2 Light w/ Battery																		6,881							
Replace Exit Lighting Fixture, w/ Battery			764					382															764		
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/ Ba								253																	
Replace Secondary Transformer, Dry, 45 kVA								6,061																	
Replace Lamp, Exit Lighting Fixture, w/ Battery			80					159					239					239					80		
Maintain Secondary Transformer, Dry, 45 kVA	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Power Panel Board, 480 V, 200 Amp.																									
Repair Power Panel Board, 480 V, 200 Amp.							143										143								
Replace Power Panel Board, 208 Y/120 V, 225 Amp.								34,576						6,915											
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	544	544	544	544	544	544	544	91	544	544	544	544	544	454	544	544	544	544	544	544	544	544	544	544	544
Replace Power Panel Board, 208 Y/120 V, 200 Amp.																		6,531							
Repair Power Panel Board, 208 Y/120 V, 200 Amp.								143																	
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/ B		475		475		475		475		475		475		475		475				475		475		475	

E10 Equipment

Maintain Vacuum Pump, 30 HP	438	438	438	438	438	438	438		438	438	438	438	438	438	438	438	438		438	438	438	438	438	438	438
Repair Vacuum Pump, 30 HP			333										333										333		
Repair Vacuum Pump, 3 HP								296					296										296		
Maintain Vacuum Pump, 3 HP	878	878		878	878	878	878	878	878	878	878	878	878	878	878	878	878		878	878	878	878	878	878	878
Replace Vacuum Pump, 3 HP			10,002															10,002							
Replace Vacuum Pump, 30 HP								13,160										13,160							

F10 Special Construction

Flush 8x6 Flexwall Hydraulic Tank	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213
Perform 8x6 Model Motor Megger	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Maintain Disconnect Switch, 100 Amp.	421	421	84	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
Replace Disconnect Switch, 60 Amp.			2,611																						
Repair Disconnect Switch, 60 Amp.													570										570		
Replace Disconnect Switch, 30 Amp.			5,251									875							2,188						
Maintain Disconnect Switch, 30 Amp.	568	568	208	568	568	568	568	568	568	568	568	509	568	568	568	568	568	568	419	568	568	568	568	568	568
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-													743						247						
Maintain Power Panel Board, 480 V, 200 Amp.	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Inspect & Clean Motor Starter, <5HP, <600V	181	121	181	181	181	181	181	181	181	181	181	181	181	181	181	181	60	181	181	121	181	181	181	181	181
Repair Secondary Transformer, Dry, 45 kVA			327																				327		
Replace Power Panel Board, 208 Y/120 V, 100 Amp.													13,747												
Replace Exit Lighting Fixture, LED									660																
Repair Disconnect Switch, 30 Amp.		374							933				2,240									374	2,240		
Replace Emergency Lighting Pack, 2 Light w/ Battery													6,881												
Replace Exit Lighting Fixture, w/ Battery			382															764					382		
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/			253																				253		
Replace Secondary Transformer, Dry, 45 kVA													6,061												
Replace Lamp, Exit Lighting Fixture, w/ Battery			159					239					239					80					159		
Maintain Secondary Transformer, Dry, 45 kVA	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91
Replace Power Panel Board, 480 V, 200 Amp.		8,810																							
Repair Power Panel Board, 480 V, 200 Amp.												143										143			
Replace Power Panel Board, 208 Y/120 V, 225 Amp.													34,576						6,915						
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	544	544	544	544	544	544	544	544	544	544	544	544	91	544	544	544	544	544	454	544	544	544	544	544	544
Replace Power Panel Board, 208 Y/120 V, 200 Amp.																							6,531		
Repair Power Panel Board, 208 Y/120 V, 200 Amp.			143										143												
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91		91	91
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/	475		475		475		475		475		475				475		475		475		475		475		475
E10 Equipment																									
Maintain Vacuum Pump, 30 HP	438	438		438	438	438	438	438	438	438	438	438		438	438	438	438	438	438	438	438	438		438	438
Repair Vacuum Pump, 30 HP								333										333							
Repair Vacuum Pump, 3 HP			296										296					296							
Maintain Vacuum Pump, 3 HP	878	878	878	878	878	878	878		878	878	878	878	878	878	878	878	878	878	878	878	878	878		878	878
Replace Vacuum Pump, 3 HP								10,002															10,002		
Replace Vacuum Pump, 30 HP			13,160										13,160										13,160		
F10 Special Construction																									
Flush 8x6 Flexwall Hydraulic Tank	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213
Perform 8x6 Model Motor Megger	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899	2,899

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Perform 8x6 SWT Low Voltage Meggering	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Perform 8x6 SWT Model Motor Megger	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Perform 8x6/9x15 Strut Motors Megger Test Section	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Cooler CTW Valve	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 CTW G5E 480V Switchgear	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Service 8x6 Tunnel Cooler Supply/Return Valves	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213
Service 8x6/9x15 Model Hydraulic Heat Exchanger	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6/9x15 SWT Model Hydraulic Fluid	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Take 8x6 Oil Sample	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Clean/Inspect 8x6 GHS Exhaust Fan	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inpect 8x6 Expansion Joint	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755
Inspect 8x6 Flexwall Hydraulic Pump	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Flexwall Hydraulic Filter	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Flexwall Hydraulic Hose	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Flexwall Hydraulic Relief Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Recertification Engineering, 9x15 Pressure Certification		9,408					9,408					9,408					9,408					9,408			
Service 8x6 Flexwall Hydraulic Strainer	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Perform 8x6 Low Voltage Meggering Bldg 39	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Flexwall Hydraulic Support Bearings	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
In-service Inspection Technician, 9x15 Pressure Certification		2,367					2,367					2,367					2,367					2,367			
Inspect 8x6 Relief Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
In-service Inspection Engineering, 9x15 Pressure Certification		1,632					1,632					1,632					1,632					1,632			
Service 8x6/9x15 Air System Filter	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6/9x15 Air System Relief Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6/9x15 Air Systems Heater	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6/9x15 Air Systems Seperators	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Recertification Technician, 9x15 Pressure Certification		12,808					12,808					12,808					12,808					12,808			
Inpsect 8x6 Electric Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Inspect 8x6 Altitude Exhaust System Valves	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6/9x15 Air System Hose	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Inspect 8x6 Cooler Strainer	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Lube & Inpsect 8x6 Test Section Strut	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Inspect 8x6 Tunnel Baffles	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Tunnel Concrete Shell	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Inspect 8x6 Tunnel Diffuser	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Inspect 8x6/9x15 Diffuser Bay Doors	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606
Inspect 8x6/9x15 Flexwall Hydraulic Gearbox	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Perform 8x6 SWT Low Voltage Meggering	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Perform 8x6 SWT Model Motor Megger	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Perform 8x6/9x15 Strut Motors Megger Test Section	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Cooler CTW Valve	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 CTW G5E 480V Switchgear	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Service 8x6 Tunnel Cooler Supply/Return Valves	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213
Service 8x6/9x15 Model Hydraulic Heat Exchanger	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6/9x15 SWT Model Hydraulic Fluid	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Take 8x6 Oil Sample	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Clean/Inspect 8x6 GHS Exhaust Fan	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inpect 8x6 Expansion Joint	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755
Inspect 8x6 Flexwall Hydraulic Pump	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Flexwall Hydraulic Filter	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Flexwall Hydraulic Hose	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Flexwall Hydraulic Relief Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Recertification Engineering, 9x15 Pressure Certification		9,408					9,408					9,408					9,408					9,408			
Service 8x6 Flexwall Hydraulic Strainer	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Perform 8x6 Low Voltage Meggering Bldg 39	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Flexwall Hydraulic Support Bearings	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
In-service Inspection Technician, 9x15 Pressure Certification		2,367					2,367					2,367					2,367					2,367			
Inspect 8x6 Relief Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
In-service Inspection Engineering, 9x15 Pressure Certification		1,632					1,632					1,632					1,632					1,632			
Service 8x6/9x15 Air System Filter	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6/9x15 Air System Relief Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6/9x15 Air Systems Heater	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6/9x15 Air Systems Seperators	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Recertification Technician, 9x15 Pressure Certification		12,808					12,808					12,808					12,808					12,808			
Inpsect 8x6 Electric Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Inspect 8x6 Altitude Exhaust System Valves	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6/9x15 Air System Hose	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Inspect 8x6 Cooler Strainer	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Lube & Inpsect 8x6 Test Section Strut	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Inspect 8x6 Tunnel Baffles	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Tunnel Concrete Shell	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Inspect 8x6 Tunnel Diffuser	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Inspect 8x6/9x15 Diffuser Bay Doors	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606	606
Inspect 8x6/9x15 Flexwall Hydraulic Gearbox	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702

Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Inspect 8x6/9x15 Flow Control Door	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303
Inspect 8x6/9x15 Hydraulic Motor	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363
Inspect 8x6/9x15 SWT Model Hydraulic Pump	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915
Inspect 8x6/9x15 Tunnel Work Hatch	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351
Inspect 8x6 CAD Valve	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106

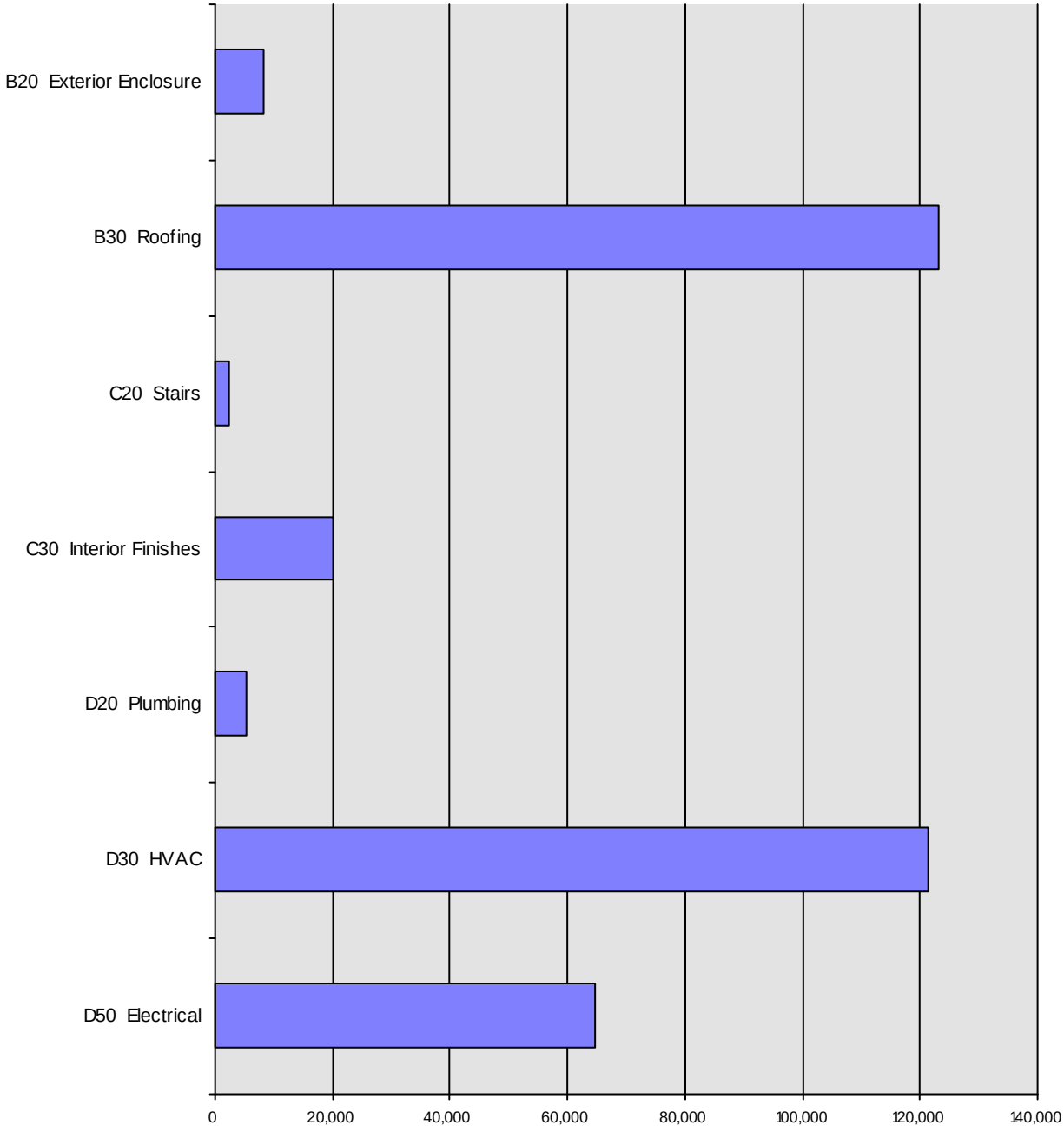
Building: Supersonic Wind Tunnel (SWT) **Facility:** Glenn Research Center

Building Num: 0039 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Inspect 8x6/9x15 Flow Control Door	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303
Inspect 8x6/9x15 Hydraulic Motor	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363
Inspect 8x6/9x15 SWT Model Hydraulic Pump	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915	4,915
Inspect 8x6/9x15 Tunnel Work Hatch	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351
Inspect 8x6 CAD Valve	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106

Building Deferred Maintenance by System Chart

Building: Supersonic Wind Tunnel (SWT) **Building Num:** 0039



All costs expressed in ($) 2012. Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral and is included in Total Deferred Maintenance.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: Supersonic Wind Tunnel (S
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $50,971,723
per SF: $1,365

Building Type: Non-Temperature Controlled
Building Gsft: 37,351
Building Number: 0039

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1965	18	Replace Membrane, Built-up Roof	$93,503	$0	$93,503
1990	8	Replace Gate Valve, 8"	$44,439	$0	$44,439
1990	3	Replace Stainless Steel Gutter, Downspouts, Fittings	$29,526	$0	$29,526
1949	49	Replace Strainer, Cast Iron, 20"	$25,634	$0	$25,634
1980	8	Replace Lightning Protection General Wiring	$10,300	$0	$10,300
1965	16	Replace Fan Coil, Two-Pipe, 800 Cfm	$10,057	$0	$10,057
1990	3	Replace Fluorescent Lighting Fixture, T12, 2-60 w	$8,927	$0	$8,927
1949	34	Replace Power Panel Board, 480 V, 200 Amp.	$8,810	$0	$8,810
1965	18	Replace Metal Floor Grating	$8,473	$0	$8,473
1965	8	Replace Steel, Insulated Wall Panels, Painted, Exterior, 2"	$8,297	$0	$8,297
1995	6	Replace Condensate Receiver Station, 10-15 Gal.	$6,956	$0	$6,956
1949	34	Replace Metal Floor Grating	$6,933	$0	$6,933
1960	23	Replace Secondary Transformer, Dry, 45 kVA	$6,061	$0	$6,061
1970	4	Replace Butterfly Valve, 18"	$5,897	$0	$5,897
1990	3	Replace Emergency Lighting Pack, 2 Light w/ Battery	$5,734	$0	$5,734
2002	1	Replace Backflow Preventer, 4"	$5,259	$0	$5,259
1988	7	Replace Vinyl Tile Flooring	$4,776	$0	$4,776
1990	3	Replace Incandescent Lighting Fixture, Basic, 100 w	$4,511	$0	$4,511
1975	18	Replace Fluorescent Lighting Fixture, T12, 2-60 w	$4,464	$0	$4,464
1990	8	Replace Exhaust Fan, Double Width, Double Inlet Airfoil, 1,000 Cf	$4,023	$0	$4,023
1965	40	Replace Steam Trap, F&T, 2"	$3,894	$0	$3,894
1993	15	Replace Pressure Reducer Valve, 4"	$3,089	$0	$3,089
1960	21	Replace Unit Heater, 12 Mbh	$3,045	$0	$3,045
1949	44	Replace Incandescent Lighting Fixture, EP, 200 w	$2,658	$0	$2,658
1960	45	Replace Steam Trap, F&T, 1"	$2,584	$0	$2,584
1970	25	Replace Motor Starter, 5-20 HP, <600 V	$2,579	$0	$2,579
1949	14	Replace Metal, Painted, Interior Railing	$2,422	$0	$2,422
1993	5	Replace Ball Valve, 4"	$2,155	$0	$2,155
1990	8	Replace Exhaust Fan, Centrifugal, 2,000 Cfm	$2,041	$0	$2,041
1970	28	Replace Public Address Speaker	$2,011	$0	$2,011
1990	3	Replace Fluorescent Lighting Fixture, T12, 4-60 w	$1,746	$0	$1,746
1970	33	Replace Thermostat	$1,615	$0	$1,615
1988	15	Replace Thermostat	$1,615	$0	$1,615

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: Supersonic Wind Tunnel (S
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $50,971,723
per SF: $1,365

Building Type: Non-Temperature Controlled
Building Gsft: 37,351
Building Number: 0039

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1980	1	Replace Unit Heater, 36 Mbh	$1,264	$0	$1,264
1993	5	Replace Ball Valve, 2"	$1,231	$0	$1,231
1970	23	Replace Emergency Lighting Pack, 2 Light w/ Battery	$1,147	$0	$1,147
1993	5	Replace Exhaust Fan, Propeller, 800 Cfm	$1,068	$0	$1,068
1970	23	Replace Halogen Lighting Fixture, 250 w	$1,011	$0	$1,011
1949	14	Replace Disconnect Switch, 30 Amp.	$875	$0	$875
1990	8	Replace Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm	$863	$0	$863
1990	5	Replace Motor Starter, 5-20 HP, <600 V	$860	$0	$860
1960	33	Replace Incandescent Lighting Fixture, Basic, 100 w	$778	$0	$778
1949	46	Replace Motor Starter, <5HP, <600V	$703	$0	$703
1990	3	Replace Fire Alarm Horn & Strobe	$532	$0	$532
1980	13	Replace Exit Lighting Fixture, w/ Battery	$382	$0	$382
1995	3	Replace Smoke Detector	$352	$0	$352
1990	8	Replace Manual Pull Station	$151	$0	$151
		Total	**$345,248**	**$0**	**$345,248**

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Operations Task Details

Whitestone Research

Building: Supersonic Wind Tunnel (SWT) **Year Built:** 1949 **Building Type:** Non-Temperature Controll

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0039

City: Cleveland, OH **Replacement Value:** $50,971,723 **per SF:** $1,365 **Building Gsft:** 37,351

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Custodial		**Level of Service: Low**			
Mechanical/Equipment	35483	Sweep Hard Floor with 48" Push Broom	$732	$119	$851
Mechanical/Equipment	35483	Empty Trash; Wipe Clean & Re-line Basket	$469	$76	$545
Shop	1867	Damp Mop Hard Floors with 24 oz. Mop Head Using Double Bucket & Wringer	$783	$127	$910
Shop	1867	Empty Trash; Wipe Clean & Re-line Basket	$296	$48	$344
Total:			**$2,280**	**$371**	**$2,651**
Operation: Grounds		**Level of Service: Medium**			
Grounds, Improved	22410	Mow Turfgrass with 21" Power Mower	$1,307	$544	$1,851
Grounds, Improved	22410	Aerate Improved Grounds	$1,192	$496	$1,687
Grounds, Improved	22410	Clear Shrubs	$796	$331	$1,127
Grounds, Improved	22410	Overseed, Improved Grounds	$596	$248	$844
Grounds, Improved	22410	Edge Clean & Trim Walks with Gas Powered Edger	$501	$208	$709
Grounds, Improved	22410	Vacuum with 30" Billy Goat	$398	$166	$564
Grounds, Improved	22410	Clear Crabgrass	$298	$124	$422
Grounds, Improved	22410	Clear Weeds with 15" Boom, Improved Grounds	$158	$66	$224
Grounds, Improved	22410	Fertilize Improved Grounds	$119	$50	$169
Grounds, Improved	22410	Trim Around Raised Objects with String Edger	$103	$43	$145
Grounds, Improved	22410	Sweep with 30" Power Rake	$79	$33	$111
Grounds, Improved	22410	Fertilize Using Power Take Off Broadcast	$0	$0	$0
Total:			**$5,546**	**$2,307**	**$7,853**
Operation: Pest Control		**Level of Service: Medium**			
Pest Controlled	37351	Install, or Check and Re-Bait 5 Rodent Boxes	$1,016	$423	$1,439
Pest Controlled	37351	Perform Crawling Insect Abatement	$763	$317	$1,080
Pest Controlled	37351	Inspect Building for Pests	$424	$0	$424
Total:			**$2,203**	**$740**	**$2,944**
Operation: Road Clearance		**Level of Service: Medium**			

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Pavement NASA	29880	Plow Paved Area	$2,298	$693	$2,991
Total:			**$2,298**	**$693**	**$2,991**
Operation: Security		**Level of Service: Medium**			
Secured Area	37351	Patrol Building Perimeter	$6,315	$1,026	$7,342
Secured Area	37351	Guard Lobby/Parking	$0	$0	$0
Total:			**$6,315**	**$1,026**	**$7,342**

Building Operations Service Details

Whitestone Research

Building: Supersonic Wind Tunnel (SWT) **Year Built:** 1949 **FTEs:** 16 **Building Type:** Non-Temperature Controll

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0039

City: Cleveland, OH **Replacement Value:** $50,971,723 **per SF:** $1,365 **Building Gsft:** 37,351

	Service*	Quantity	Rate	Cost
Operation: Security	**Level of Service: Medium**			
	Intrusion Detection Systems	1	$4,986	$4,986
	System Monitoring	1	$3,615	$3,615
	Access Control	1	$2,690	$2,690
	Total:			**$11,291**
Operation: Telecom	**Level of Service: High**			
	Local Telephone	16	$468	$7,488
	Data	16	$3,588	$3,846
	Long Distance Telephone	16	$192	$3,072
	Total:			**$14,406**

All costs expressed in ($) 2012.

18-Dec-14

* Secutity may be composed of service and task based cost. See Building Operations Task Details for Security Tasks.

Building Operations Management Details

Whitestone Research

Building: Supersonic Wind Tunnel (SWT) **Year Built:** 1949 **Building Type:** Non-Temperature Controll

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0039

City: Cleveland, OH **Replacement Value:** $50,971,723 **per SF:** $1,365 **Building Gsft:** 37,351

	Service	Demand	UM	PRV	Cost
Operation: Management	**Level of Service: Low**				
	Management	0.3%	PRV	$50,971,723	$127,429
	Total:				**$127,429**

Average M&R Costs

Whitestone Research

Building: SWT Drive Equipment Building
Building Number: 0053
Facility: Glenn Research Center
City: Cleveland, OH

GSFT: 22,152
PRV: $29,901,628
Built Date: 1949

M&R Average Annual Cost Forecasts

	Current Year	5 Year	20 Year	50 Year
PM & Minor Repair:	$207,733	$209,146	$207,719	$207,795
Unscheduled Maintenance:	$24,378	$24,605	$23,328	$23,365
Renewal & Replacement:	$12,399	$43,399	$212,220	$166,838
Total M&R Costs:	$244,510	$277,150	$443,267	$397,998
Per GSFT:	$11.04	$12.51	$20.01	$17.97
As % of PRV:	0.82%	0.93%	1.48%	1.33%

All costs expressed in ($) 2012.
Based on a 50-Year Forecast.

Building Component List

Whitestone Research

Building: SWT Drive Equipment Building **Year Built:** 1949 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0053

City: Cleveland, OH **Replacement Value:** $29,901,628 **per SF:** $1,350 **Building Gsft:** 22,152

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
B2010		Concrete Block, Painted, Exterior, 1st Floor	1949	4775 Sq Ft		
B2010		Concrete Block, Painted, Exterior, 2nd Floor	1949	3800 Sq Ft		
B2010		Steel, Painted, Exterior, 1st Floor	1949	2770 Sq Ft		
B2010		Steel, Painted, Exterior, 2nd Floor	1949	2770 Sq Ft		
B2020		Steel Operable Window, 24 sf, 1st Fl	1949	15 Each		
B2020		Steel Operable Window, 24 sf, 2nd Fl	1949	15 Each		
B2030		Steel w/ Safety Glass, Painted, Exterior Door	1960	2 Each		
B2030		Steel, 14'x10', Painted, Overhead Coiling Door, Motorized	1990	1 Each		
B3010		Aluminum Gutter, Downspouts, Fittings	1949	0.5 K Ln Ft		
B3010		Built-up Roof	1949	5050 Sq Ft		
B3010		Metal Roof	1949	2240 Sq Ft		
C1010		Toilet Partitions, Painted Metal, Overhead Braced	1960	1 Each		
C1020		Steel, Painted, Interior Door	1960	9 Each		
C1020		Steel, Painted, Interior Door	2000	2 Each		
C1020		Steel, Painted, w/ Safety Glass, Interior Door	1960	3 Each		
C1020		Wood, Solid Core w/ Safety Glass, Painted, Interior Door	1960	2 Each		
C2010		Concrete, Interior Stairs	1949	450 Sq Ft		
C2010		Metal, Painted, Interior Railing	1949	550 Ln Ft		
C2010		Metal, Painted, Interior Stairs	1949	200 Sq Ft		
C3010		Acoustical Tile, Painted, Interior Wall Finish	1960	750 Sq Ft		
C3010		Concrete Block, Painted, Interior Wall Finish	1949	15010 Sq Ft		
C3010		Concrete, Painted, Interior Wall Finish	1949	750 Sq Ft		
C3010		Steel Fixed Window, 12 sf, Interior	1949	3 Each		
C3010		Steel Fixed Window, 24 sf, Interior	1949	3 Each		
C3010		Steel Fixed Window, 24 sf, Interior	1949	3 Each		
C3010		Steel, Interior Wall Finish	1949	7015 Sq Ft		Perforated
C3010		Steel, Painted, Interior Wall Finish	1949	1650 Sq Ft		
C3020		Concrete, Painted Flooring	1949	14150 Sq Ft		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
C3020		Steel Flooring	1949	1010 Sq Ft		
C3020		Vinyl Tile Flooring	1960	550 Sq Ft		
C3030		Acoustical Tile Ceiling	1949	550 Sq Ft		
C3030		Concrete Ceiling	1949	3060 Sq Ft		
C3030		Concrete, Painted Ceiling	1949	10060 Sq Ft		
C3030		Gypsum Board, Finished Ceiling	1949	90 Sq Ft		
C3030		Metal Ceiling	1949	1950 Sq Ft		Perforated panels
D1010		Bridge Crane, Overhead, 30 Ton	1980	1 Each		
D2010		Drinking Fountain, Refrigerated	2000	1 Each		
D2010		Emergency Eye Wash & Shower Station	2011	1 Each		
D2010		Emergency Eye Wash & Shower Station	2008	1 Each		
D2010		Lavatory, Vitreous China	1960	2 Each		
D2010		Service Sink, Iron, Enamel	1960	1 Each		
D2010		Shower, Enameled Steel	1980	1 Each		
D2010		Tankless Water Closet	1980	1 Each		
D2010		Urinal, Vitreous China	1960	1 Each		
D2010		Water Cooler, Electric	2010	1 Each		
D2020		Gate Valve, 2-3"	1990	1 Each		
D2020		Gate Valve, 2-3"	2000	2 Each		
D2020		Pipe & Fittings, 1" Steel	1949	0.15 K Ln Ft		
D2020		Pipe & Fittings, 2" Copper, Cold Water	2000	0.075 K Ln Ft		
D2020		Pipe & Fittings, 3/4" Steel	1949	0.05 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Cold Water	1949	0.15 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Hot Water	1949	0.05 K Ln Ft		
D2020		Water Heater, Electric, 52 Gal.	2010	1 Each		
D2030		Floor Drain	1949	8 Each		
D2040		Pipe & Fittings, 3" Cast Iron	1949	0.275 K Ln Ft		
D2040		Roof Drain, 4-6"	1949	2 Each		
D2040		Sump Pump, 1/2 HP	2008	3 Each		
D3010		Oil Pump, 10 HP	1980	2 Each		
D3010		Oil Pump, 10 HP	1960	2 Each		Lube
D3010		Oil Pump, 3 HP	2000	6 Each		Shaft Lifting Pump
D3010		Oil Pump, 3 HP	2013	3 Each		Lube Filtration
D3010		Oil Storage Tank, 275 Gal.	1993	1 Each		Lube Tank
D3010		Oil Storage Tank, 30 Gal.	1993	1 Each		Lube Tank
D3010		Oil Storage Tank, 550 Gal.	1960	4 Each		Lube

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D3010		Oil Storage Tank, Steel, 1,500 Gal.	1990	1 Each		Diesel Tank
D3010		Oil Tank, 10 Gal.	1993	1 Each		Lube
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	1949	0.35 K Ln Ft		
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	1960	0.55 K Ln Ft		
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	2000	0.75 K Ln Ft		
D3010		Pipe & Fittings, 2" Steel, Gas/Oil	2000	0.55 K Ln Ft		
D3010		Pipe & Fittings, 2" Steel, Gas/Oil	1960	0.25 K Ln Ft		
D3010		Pipe & Fittings, 4" Steel, Fuel Oil	1960	0.55 K Ln Ft		
D3020		Ball Valve, 4"	1993	4 Each		Lube
D3020		Condensate Receiver Station, 10-15 Gal.	1949	1 Each		
D3020		Flow Control Valve, Motorized, 2"	1993	1 Each		Lube
D3020		Gate Valve, 20"	1949	2 Each		
D3020		Gate Valve, 20"	2000	1 Each		
D3020		Gate Valve, 2-3"	1980	4 Each		
D3020		Gate Valve, 2-3"	1993	1 Each		Lube
D3020		Gate Valve, 2-3"	1960	20 Each		
D3020		Gate Valve, 2-3"	1949	1 Each		
D3020		Gate Valve, 2-3"	2000	1 Each		
D3020		Gate Valve, 6"	1990	4 Each		
D3020		Pipe & Fittings, 1" Steel	1949	1.1 K Ln Ft		
D3020		Pipe & Fittings, 1" Steel	1960	1.25 K Ln Ft		
D3020		Pipe & Fittings, 1" Steel	2000	0.5 K Ln Ft		
D3020		Pipe & Fittings, 10" Steel	1949	0.1 K Ln Ft		
D3020		Pipe & Fittings, 18" Steel	1949	0.25 K Ln Ft		
D3020		Pipe & Fittings, 2" Copper	1960	0.55 K Ln Ft		
D3020		Pipe & Fittings, 2" Copper	2000	0.25 K Ln Ft		
D3020		Pipe & Fittings, 4" Steel	1949	0.3 K Ln Ft		
D3020		Pipe & Fittings, 4" Steel	2000	0.25 K Ln Ft		
D3020		Pipe & Fittings, 6" Steel	1949	0.15 K Ln Ft		
D3020		Pipe Insulation, Fiberglass, Heating Water/Steam	1960	0.8 K Ln Ft		
D3020		Pipe Insulation, Fiberglass, Heating Water/Steam	2000	1 K Ln Ft		
D3020		Pipe Insulation, Fiberglass, Heating Water/Steam	1949	0.5 K Ln Ft		
D3020		Radiator, Finned, Wall	1960	1 Each		
D3020		Steam Trap, F&T, 1"	1990	6 Each		
D3020		Steam Trap, F&T, 1"	1960	4 Each		
D3020		Steam Trap, F&T, 1"	1949	4 Each		

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D3020		Steam Trap, F&T, 2"	1990	6 Each		
D3030		Check Valve, 8"	1949	2 Each		
D3030		Circulation Pump, 50 HP, Chiller & Condenser Water	1960	2 Each		Electrolyte Fluid
D3030		Flow Control Valve, Motorized, 6"	1960	3 Each		
D3030		Flow Control Valve, Motorized, 8"	2008	1 Each		
D3030		Gate Valve, 10"	1949	2 Each		
D3030		Gate Valve, 14"	1949	1 Each		
D3030		Gate Valve, 6"	1960	1 Each		
D3030		Gate Valve, 8"	1949	2 Each		
D3030		Heat Exchanger, Plate/frame	2008	1 Each		Polaris
D3030		Pipe & Fittings, 10" Steel	1949	0.12 K Ln Ft		
D3030		Pipe & Fittings, 12" Steel	1949	0.2 K Ln Ft		
D3030		Pipe & Fittings, 18" Steel	1949	0.15 K Ln Ft		
D3030		Pipe & Fittings, 18" Steel	1949	0.075 K Ln Ft		
D3030		Pipe & Fittings, 2" Steel	1960	0.55 K Ln Ft		
D3030		Pipe & Fittings, 3" Copper	1949	0.15 K Ln Ft		
D3030		Pipe & Fittings, 4" Steel	1993	0.2 K Ln Ft		
D3030		Pipe & Fittings, 6" Steel	1949	0.15 K Ln Ft		
D3030		Pipe & Fittings, 8" Steel	1949	0.1 K Ln Ft		
D3030		Pipe Insulation, Fiberglass, Chilled Water	1960	1 K Ln Ft		
D3030		Pipe Insulation, Fiberglass, Chilled Water	2000	0.5 K Ln Ft		
D3030		Strainer, Cast Iron, 16"	1949	1 Each		
D3030		Strainer, Cast Iron, 16"	1990	1 Each		
D3030		Water Storage Tank, 750 Gal.	1949	9 Each		Electrolyte Tank
D3040		Air Handler, Single Zone, 2,500 Cfm	2005	1 Each		
D3040		Ductwork	2005	750 Lbs		
D3040		Ductwork	1985	500 Lbs		
D3040		Ductwork	2000	300 Lbs		
D3040		Exhaust Fan, Ceiling, 200-500 Cfm	1995	1 Each		
D3040		Exhaust Fan, Centrifugal, 100,000 Cfm	1990	3 Each		
D3040		Exhaust Fan, Centrifugal, 2,000 Cfm	1980	1 Each		
D3040		Exhaust Fan, Propeller, 1,000 Cfm	1993	1 Each		
D3040		Residential Type Ceiling Fan	2000	4 Each		
D3040		Steel Damper, Motorized	2005	2 Each		
D3040		Steel Damper, Motorized, w/ Actuator	1980	5 Each		
D3040		Ventilator, 12"	1949	4 Each		

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D3050		Air Conditioner, Rooftop, Single Zone, 5 Ton	2005	1 Each		
D3050		Unit Heater, 12 Mbh	1949	2 Each		
D3050		Unit Heater, 36 Mbh	1990	6 Each		
D3050		Unit Heater, 36 Mbh	1960	2 Each		
D3060		Direct Digital Controls, System Points	2010	456 Each		
D3060		HVAC Control Panel	1949	1 Each		
D3060		Thermostat	1960	4 Each		
D3060		Thermostat	2005	2 Each		
D4030		Fire Extinguisher	2010	10 Each		
D5010		Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.	1985	6 Each		
D5010		Circuit Breaker, 600 V, 30-60 Amp., 3Ph.	1985	4 Each		
D5010		Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	1985	10 Each		
D5010		Disconnect Switch, 200 Amp.	1980	1 Each		
D5010		Disconnect Switch, 30 Amp.	1980	4 Each		
D5010		Disconnect Switch, 30 Amp.	1970	4 Each		
D5010		Disconnect Switch, 30 Amp.	2005	4 Each		
D5010		Disconnect Switch, 60 Amp.	1980	1 Each		
D5010		Disconnect Switch, 60 Amp.	1990	1 Each		
D5010	MDP-P01	Distribution Panel Board	1990	1 Each		600A
D5010		Motor Control Center w/ Main Breaker, 480 V, 600 Amp.	1985	4 Each		
D5010		Motor Starter, <5HP, <600V	2002	1 Each		
D5010		Motor Starter, <5HP, <600V	1980	1 Each		
D5010		Motor Starter, <5HP, <600V	1960	6 Each		
D5010		Motor Starter, 5-20 HP, <600 V	1960	1 Each		
D5010	PTR01, PTR02, PTR01	Power Panel Board, 208 Y/120 V, 200 Amp.	1993	3 Each		
D5010	P01, P02, P0103, P010	Power Panel Board, 208 Y/120 V, 225 Amp	1990	4 Each		
D5010	P0104	Power Panel Board, 208 Y/120 V, 400 Amp.	2009	2 Each		
D5010	P0101, P0102	Power Panel Board, 480 V, 400 Amp.	1990	1 Each		
D5010	G5B1A1, B2F1B2	Secondary Transformer, Dry, 225 kVA	1985	2 Each		
D5010	B2F1B3	Secondary Transformer, Dry, 300 kVA	1985	1 Each		
D5010		Transfer Switch, Auto, 600 V, 600 Amp.	1960	1 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1980	10 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1995	3 Each		
D5020		Exit Lighting Fixture, w/ Battery	1970	4 Each		
D5020		Exit Lighting Fixture, w/ Battery	1949	3 Each		
D5020		Fluorescent Lighting Fixture, T12, 4-60 w	1980	16 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1970	6 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1980	30 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1995	15 Each		
D5020		High Pressure Sodium Lighting Fixture, 250 w	2000	14 Each		
D5020		Metal Halide Lighting Fixture, Low Bay, 250 w	2000	1 Each		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150 w	1990	3 Each		
D5020		Receptacle, 208 V, 3 phase	1985	10 Each		
D5020		Receptacle, 120 V, 15 Amp.	1970	40 Each		
D5020		Receptacle, 120 V, 15 Amp.	1995	20 Each		
D5020		Receptacle, 120 V, 15 Amp.	1949	100 Each		
D5020		Receptacle, 120 V, 20 Amp.	1949	10 Each		
D5020		Receptacle, 120 V, 20 Amp.	1985	20 Each		
D5030		Fire Alarm Bell, 6"	1970	1 Each		
D5030		Fire Alarm Horn & Strobe	1990	6 Each		
D5030		Manual Pull Station	1990	5 Each		
D5030		Public Address Speaker	1970	4 Each		
D5030		Smoke Detector	1990	20 Each		
D5090		Electric Motor, 75 HP	1949	1 Each		
D5090		Generator, Diesel, 175 kw	2002	1 Each		
D5090		Meter, Electrical, 208 Volt, 400 Amp.	2005	1 Each		
F1030		8x6 Drive Axial Compressor	1949	1 Each		
F1030		8x6 Drive Battery	1949	1 Each		
F1030		8x6 Drive Compressor Lube Oil Purifier	1949	1 Each		
F1030		8x6 Drive CTW Strainer	1949	1 Each		
F1030		8x6 Drive CTW System Valves	1949	1 Each		
F1030		8x6 Drive Downstream Filter Fan	1949	1 Each		
F1030		8x6 Drive DPU4-EQ770 WDPF Cabinet	1949	1 Each		
F1030		8x6 Drive Duplex Controls Panel	1949	1 Each		
F1030		8x6 Drive Dynamic Braking MG System	1949	1 Each		
F1030		8x6 Drive Dynamic Braking Switchgear	1949	1 Each		
F1030		8x6 Drive Electric Cooler Valve	1949	1 Each		
F1030		8x6 Drive Electrolyte Cooler	1949	1 Each		
F1030		8x6 Drive Electrolyte Pump System Valves	1949	1 Each		
F1030		8x6 Drive Electrolyte Pumps	1949	1 Each		
F1030		8x6 Drive Electrolyte System	1949	1 Each		
F1030		8x6 Drive Electrolyte Y-Type Strainer	1949	1 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
F1030		8x6 Drive Entrance Oil Cooler	1949	1 Each		
F1030		8x6 Drive Exit Oil Cooler	1949	1 Each		
F1030		8x6 Drive Lift Pump Assembly	1949	1 Each		
F1030		8x6 Drive Liquid Rheostat Pilot Motor	1949	1 Each		
F1030		8x6 Drive Lube Oil Filter	1949	1 Each		
F1030		8x6 Drive Lube Oil Pump/Motor	1949	1 Each		
F1030		8x6 Drive Motor 1 Ring Comp Fan & Motor	1949	1 Each		
F1030		8x6 Drive Motor 2 Ring Comp Fan & Motor	1949	1 Each		
F1030		8x6 Drive Motor 2400V Switchgear	1949	1 Each		
F1030		8x6 Drive Motor 3 Ring Comp Fan & Motor	1949	1 Each		
F1030		8x6 Drive Motor Air Cooler	1949	1 Each		
F1030		8x6 Drive Motor Blowers	1949	1 Each		
F1030		8x6 Drive Motor MCE	1949	1 Each		
F1030		8x6 Drive Motor Temp Regulating Valve	1949	1 Each		
F1030		8x6 Drive Motors	1949	1 Each		
F1030		8x6 Drive Oil Purifier	1949	1 Each		
F1030		8x6 Drive Speed Control Duplex Panels	1949	1 Each		
F1030		8x6 Drive Speed Electrolyte Motor	1949	1 Each		
F1030		8x6 Drive Sump Pump	1949	1 Each		
F1030		8x6 Drive Thrust High Pressure Pump Motor	1949	1 Each		
F1030		8x6 Drive Thrust Oil Cooler	1949	1 Each		
F1030		8x6 Low Voltage Meggering Bldg 53	1949	1 Each		
F1030		8x6 Return/Supply Valve Bldg 53	1949	1 Each		
F1030		8x6 Thermography Bldg 53	1949	1 Each		
F1030		8x6 Thermography Bldg 53	1949	1 Each		
F1030		8x6 Turning Gear	1949	1 Each		

Building Extended Component List with Remaining Service Life

Whitestone Research 04-Jun-15

Building: SWT Drive Equipment Building **Year Built:** 1949 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0053

City: Cleveland, OH **Replacement Value:** $29,901,628 **per SF:** $1,350 **Building Gsft:** 22,152

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
B2010		Concrete Block, Painted, Exterior, 1st Floor	1949	35	4775 Sq Ft					
B2010		Concrete Block, Painted, Exterior, 2nd Floor	1949	35	3800 Sq Ft					
B2010		Steel, Painted, Exterior, 1st Floor	1949	10	2770 Sq Ft					
B2010		Steel, Painted, Exterior, 2nd Floor	1949	10	2770 Sq Ft					
B2020		Steel Operable Window, 24 sf, 1st Fl	1949	10	15 Each					
B2020		Steel Operable Window, 24 sf, 2nd Fl	1949	10	15 Each					
B2030		Steel w/ Safety Glass, Painted, Exterior Door	1960	21	2 Each					
B2030		Steel, 14'x10', Painted, Overhead Coiling Door	1990	11	1 Each					
B3010		Aluminum Gutter, Downspouts, Fittings	1949	4	0.5 K Ln Ft					
B3010		Built-up Roof	1949	-35	5050 Sq Ft	$56,213	$0	$56,213		
B3010		Metal Roof	1949	9	2240 Sq Ft					
C1010		Toilet Partitions, Painted Metal, Overhead Bra	1960	-34	1 Each	$882	$0	$882		
C1020		Steel, Painted, Interior Door	2000	61	2 Each					
C1020		Steel, Painted, Interior Door	1960	21	9 Each					
C1020		Steel, Painted, w/ Safety Glass, Interior Door	1960	21	3 Each					
C1020		Wood, Solid Core w/ Safety Glass, Painted, Int	1960	-14	2 Each	$2,912	$0	$2,912		
C2010		Concrete, Interior Stairs	1949	10	450 Sq Ft					
C2010		Metal, Painted, Interior Railing	1949	-15	550 Ln Ft	$16,655	$0	$16,655		
C2010		Metal, Painted, Interior Stairs	1949	10	200 Sq Ft					
C3010		Acoustical Tile, Painted, Interior Wall Finish	1960	6	750 Sq Ft					
C3010		Concrete Block, Painted, Interior Wall Finish	1949	10	15010 Sq Ft					

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Forecast Year: 2013

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
C3010		Concrete, Painted, Interior Wall Finish	1949	10	750 Sq Ft					
C3010		Steel Fixed Window, 12 sf, Interior	1949	10	3 Each					
C3010		Steel Fixed Window, 24 sf, Interior	1949	10	3 Each					
C3010		Steel Fixed Window, 24 sf, Interior	1949	10	3 Each					
C3010		Steel, Interior Wall Finish	1949	10	7015 Sq Ft					Perforated
C3010		Steel, Painted, Interior Wall Finish	1949	10	1650 Sq Ft					
C3020		Concrete, Painted Flooring	1949	10	14150 Sq Ft					
C3020		Steel Flooring	1949	10	1010 Sq Ft					
C3020		Vinyl Tile Flooring	1960	3	550 Sq Ft					
C3030		Acoustical Tile Ceiling	1949	5	550 Sq Ft					
C3030		Concrete Ceiling	1949	10	3060 Sq Ft					
C3030		Concrete, Painted Ceiling	1949	10	10060 Sq Ft					
C3030		Gypsum Board, Finished Ceiling	1949	10	90 Sq Ft					
C3030		Metal Ceiling	1949	10	1950 Sq Ft					Perforated panels
D1010		Bridge Crane, Overhead, 30 Ton	1980	9	1 Each					
D2010		Drinking Fountain, Refrigerated	2000	-4	1 Each	$1,064	$0	$1,064		
D2010		Emergency Eye Wash & Shower Station	2011	22	1 Each					
D2010		Emergency Eye Wash & Shower Station	2008	19	1 Each					
D2010		Lavatory, Vitreous China	1960	-19	2 Each	$1,004	$0	$1,004		
D2010		Service Sink, Iron, Enamel	1960	-19	1 Each	$1,089	$0	$1,089		
D2010		Shower, Enameled Steel	1980	1	1 Each					
D2010		Tankless Water Closet	1980	1	1 Each					
D2010		Urinal, Vitreous China	1960	-19	1 Each	$945	$0	$945		
D2010		Water Cooler, Electric	2010	6	1 Each					
D2020		Gate Valve, 2-3"	1990	-7	1 Each	$581	$0	$581		
D2020		Gate Valve, 2-3"	2000	3	2 Each					
D2020		Pipe & Fittings, 1" Steel	1949	10	0.15 K Ln Ft					
D2020		Pipe & Fittings, 2" Copper, Cold Water	2000	11	0.075 K Ln Ft					

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D2020		Pipe & Fittings, 3/4" Steel	1949	10	0.05 K Ln Ft					
D2020		Pipe Insulation, Fiberglass, Cold Water	1949	-40	0.15 K Ln Ft	$144	$0	$144		
D2020		Pipe Insulation, Fiberglass, Hot Water	1949	-40	0.05 K Ln Ft	$48	$0	$48		
D2020		Water Heater, Electric, 52 Gal.	2010	11	1 Each					
D2030		Floor Drain	1949	-25	8 Each	$2,620	$0	$2,620		
D2040		Pipe & Fittings, 3" Cast Iron	1949	10	0.275 K Ln Ft					
D2040		Roof Drain, 4-6"	1949	4	2 Each					
D2040		Sump Pump, 1/2 HP	2008	14	3 Each					
D3010		Oil Pump, 10 HP	1960	2	2 Each					Lube
D3010		Oil Pump, 10 HP	1980	2	2 Each					
D3010		Oil Pump, 3 HP	2013	12	3 Each					Lube Filtration
D3010		Oil Pump, 3 HP	2000	9	6 Each					Shaft Lifting Pump
D3010		Oil Storage Tank, 275 Gal.	1993	5	1 Each					Lube Tank
D3010		Oil Storage Tank, 30 Gal.	1993	5	1 Each					Lube Tank
D3010		Oil Storage Tank, 550 Gal.	1960	-28	4 Each	$19,867	$0	$19,867		Lube
D3010		Oil Storage Tank, Steel, 1,500 Gal.	1990	2	1 Each					Diesel Tank
D3010		Oil Tank, 10 Gal.	1993	29	1 Each					Lube
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	1949	-40	0.35 K Ln Ft	$3,997	$0	$3,997		
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	2000	11	0.75 K Ln Ft					
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	1960	-29	0.55 K Ln Ft	$6,281	$0	$6,281		
D3010		Pipe & Fittings, 2" Steel, Gas/Oil	1960	21	0.25 K Ln Ft					
D3010		Pipe & Fittings, 2" Steel, Gas/Oil	2000	61	0.55 K Ln Ft					
D3010		Pipe & Fittings, 4" Steel, Fuel Oil	1960	21	0.55 K Ln Ft					
D3020		Ball Valve, 4"	1993	-6	4 Each	$4,309	$0	$4,309		Lube
D3020		Condensate Receiver Station, 10-15 Gal.	1949	-53	1 Each	$6,956	$0	$6,956		
D3020		Flow Control Valve, Motorized, 2"	1993	-4	1 Each	$1,665	$0	$1,665		Lube
D3020		Gate Valve, 20"	2000	1	1 Each					
D3020		Gate Valve, 20"	1949	-50	2 Each	$79,467	$0	$79,467		

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3020		Gate Valve, 2-3"	2000	1	1 Each					
D3020		Gate Valve, 2-3"	1960	-39	20 Each	$11,626	$0	$11,626		
D3020		Gate Valve, 2-3"	1993	-6	1 Each	$581	$0	$581		Lube
D3020		Gate Valve, 2-3"	1980	-19	4 Each	$2,325	$0	$2,325		
D3020		Gate Valve, 2-3"	1949	-50	1 Each	$581	$0	$581		
D3020		Gate Valve, 6"	1990	-9	4 Each	$10,738	$0	$10,738		
D3020		Pipe & Fittings, 1" Steel	2000	61	0.5 K Ln Ft					
D3020		Pipe & Fittings, 1" Steel	1960	21	1.25 K Ln Ft					
D3020		Pipe & Fittings, 1" Steel	1949	10	1.1 K Ln Ft					
D3020		Pipe & Fittings, 10" Steel	1949	10	0.1 K Ln Ft					
D3020		Pipe & Fittings, 18" Steel	1949	10	0.25 K Ln Ft					
D3020		Pipe & Fittings, 2" Copper	2000	11	0.25 K Ln Ft					
D3020		Pipe & Fittings, 2" Copper	1960	-29	0.55 K Ln Ft	$6,281	$0	$6,281		
D3020		Pipe & Fittings, 4" Steel	1949	10	0.3 K Ln Ft					
D3020		Pipe & Fittings, 4" Steel	2000	61	0.25 K Ln Ft					
D3020		Pipe & Fittings, 6" Steel	1949	10	0.15 K Ln Ft					
D3020		Pipe Insulation, Fiberglass, Heating Water/Ste	2000	11	1 K Ln Ft					
D3020		Pipe Insulation, Fiberglass, Heating Water/Ste	1960	-29	0.8 K Ln Ft	$1,029	$0	$1,029		
D3020		Pipe Insulation, Fiberglass, Heating Water/Ste	1949	-40	0.5 K Ln Ft	$644	$0	$644		
D3020		Radiator, Finned, Wall	1960	-34	1 Each	$227	$0	$227		
D3020		Steam Trap, F&T, 1"	1990	-16	6 Each	$2,216	$0	$2,216		
D3020		Steam Trap, F&T, 1"	1949	-57	4 Each	$1,477	$0	$1,477		
D3020		Steam Trap, F&T, 1"	1960	-46	4 Each	$1,477	$0	$1,477		
D3020		Steam Trap, F&T, 2"	1990	-16	6 Each	$5,843	$0	$5,843		
D3030		Check Valve, 8"	1949	-26	2 Each	$10,249	$0	$10,249		
D3030		Circulation Pump, 50 HP, Chiller & Condenser	1960	-22	2 Each	$38,311	$0	$38,311		Electrolyte Fluid
D3030		Flow Control Valve, Motorized, 6"	1960	-18	3 Each	$15,168	$0	$15,168		
D3030		Flow Control Valve, Motorized, 8"	2008	30	1 Each					

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3030		Gate Valve, 10"	1949	-50	2 Each	$10,679	$0	$10,679		
D3030		Gate Valve, 14"	1949	-50	1 Each	$16,924	$0	$16,924		
D3030		Gate Valve, 6"	1960	-39	1 Each	$2,685	$0	$2,685		
D3030		Gate Valve, 8"	1949	-50	2 Each	$7,407	$0	$7,407		
D3030		Heat Exchanger, Plate/frame	2008	17	1 Each					Polaris
D3030		Pipe & Fittings, 10" Steel	1949	10	0.12 K Ln Ft					
D3030		Pipe & Fittings, 12" Steel	1949	10	0.2 K Ln Ft					
D3030		Pipe & Fittings, 18" Steel	1949	10	0.075 K Ln Ft					
D3030		Pipe & Fittings, 18" Steel	1949	10	0.15 K Ln Ft					
D3030		Pipe & Fittings, 2" Steel	1960	21	0.55 K Ln Ft					
D3030		Pipe & Fittings, 3" Copper	1949	-40	0.15 K Ln Ft	$3,173	$0	$3,173		
D3030		Pipe & Fittings, 4" Steel	1993	54	0.2 K Ln Ft					
D3030		Pipe & Fittings, 6" Steel	1949	10	0.15 K Ln Ft					
D3030		Pipe & Fittings, 8" Steel	1949	10	0.1 K Ln Ft					
D3030		Pipe Insulation, Fiberglass, Chilled Water	1960	-29	1 K Ln Ft	$956	$0	$956		
D3030		Pipe Insulation, Fiberglass, Chilled Water	2000	11	0.5 K Ln Ft					
D3030		Strainer, Cast Iron, 16"	1990	-9	1 Each	$10,318	$0	$10,318		
D3030		Strainer, Cast Iron, 16"	1949	-50	1 Each	$10,318	$0	$10,318		
D3030		Water Storage Tank, 750 Gal.	1949	-45	9 Each	$42,729	$0	$42,729		Electrolyte Tank
D3040		Air Handler, Single Zone, 2,500 Cfm	2005	7	1 Each					
D3040		Ductwork	1985	-3	500 Lbs	$1,126	$0	$1,126		
D3040		Ductwork	2000	12	300 Lbs					
D3040		Ductwork	2005	17	750 Lbs					
D3040		Exhaust Fan, Ceiling, 200-500 Cfm	1995	-4	1 Each	$863	$0	$863		
D3040		Exhaust Fan, Centrifugal, 100,000 Cfm	1990	4	3 Each					
D3040		Exhaust Fan, Centrifugal, 2,000 Cfm	1980	-19	1 Each	$2,041	$0	$2,041		
D3040		Exhaust Fan, Propeller, 1,000 Cfm	1993	-6	1 Each	$1,183	$0	$1,183		
D3040		Residential Type Ceiling Fan	2000	6	4 Each					

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3040		Steel Damper, Motorized	2005	51	2 Each					
D3040		Steel Damper, Motorized, w/ Actuator	1980	-14	5 Each	$5,279	$0	$5,279		
D3040		Ventilator, 12"	1949	-39	4 Each	$1,170	$0	$1,170		
D3050		Air Conditioner, Rooftop, Single Zone, 5 Ton	2005	23	1 Each					
D3050		Unit Heater, 12 Mbh	1949	-33	2 Each	$1,522	$0	$1,522		
D3050		Unit Heater, 36 Mbh	1990	8	6 Each					
D3050		Unit Heater, 36 Mbh	1960	-22	2 Each	$2,528	$0	$2,528		
D3060		Direct Digital Controls, System Points	2010	6	456 Each					
D3060		HVAC Control Panel	1949	-50	1 Each	$3,662	$0	$3,662		
D3060		Thermostat	1960	-44	4 Each	$1,615	$0	$1,615		
D3060		Thermostat	2005	1	2 Each					
D4030		Fire Extinguisher	2010	8	10 Each					
D5010		Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.	1985	21	6 Each					
D5010		Circuit Breaker, 600 V, 30-60 Amp., 3Ph.	1985	21	4 Each					
D5010		Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	1985	21	10 Each					
D5010		Disconnect Switch, 200 Amp.	1980	16	1 Each					
D5010		Disconnect Switch, 30 Amp.	1980	16	4 Each					
D5010		Disconnect Switch, 30 Amp.	2005	41	4 Each					
D5010		Disconnect Switch, 30 Amp.	1970	6	4 Each					
D5010		Disconnect Switch, 60 Amp.	1980	16	1 Each					
D5010		Disconnect Switch, 60 Amp.	1990	26	1 Each					
D5010	MDP-P01	Distribution Panel Board	1990	6	1 Each					600A
D5010		Motor Control Center w/ Main Breaker, 480 V,	1985	-9	4 Each	$85,654	$0	$85,654		
D5010		Motor Starter, <5HP, <600V	2002	6	1 Each					
D5010		Motor Starter, <5HP, <600V	1960	-36	6 Each	$4,216	$0	$4,216		
D5010		Motor Starter, <5HP, <600V	1980	-16	1 Each	$703	$0	$703		
D5010		Motor Starter, 5-20 HP, <600 V	1960	-36	1 Each	$860	$0	$860		
D5010	PTR01, PTR02, PTR0	Power Panel Board, 208 Y/120 V, 200 Amp.	1993	9	3 Each					

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Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5010	P01, P02, P0103, P01	Power Panel Board, 208 Y/120 V, 225 Amp	1990	6	4 Each					
D5010	P0104	Power Panel Board, 208 Y/120 V, 400 Amp.	2009	25	2 Each					
D5010	P0101, P0102	Power Panel Board, 480 V, 400 Amp.	1990	6	1 Each					
D5010	G5B1A1, B2F1B2	Secondary Transformer, Dry, 225 kVA	1985	1	2 Each					
D5010	B2F1B3	Secondary Transformer, Dry, 300 kVA	1985	1	1 Each					
D5010		Transfer Switch, Auto, 600 V, 600 Amp.	1960	-36	1 Each	$15,118	$0	$15,118		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1995	1	3 Each					
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1980	-14	10 Each	$11,467	$0	$11,467		
D5020		Exit Lighting Fixture, w/ Battery	1970	-24	4 Each	$1,527	$0	$1,527		
D5020		Exit Lighting Fixture, w/ Battery	1949	-45	3 Each	$1,146	$0	$1,146		
D5020		Fluorescent Lighting Fixture, T12, 4-60 w	1980	-14	16 Each	$3,105	$0	$3,105		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1980	-14	30 Each	$5,822	$0	$5,822		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1970	-24	6 Each	$1,164	$0	$1,164		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1995	1	15 Each					
D5020		High Pressure Sodium Lighting Fixture, 250 w	2000	6	14 Each					
D5020		Metal Halide Lighting Fixture, Low Bay, 250 w	2000	6	1 Each					
D5020		Metal Halide Lighting Fixture, Wall Mount, 150	1990	-4	3 Each	$1,712	$0	$1,712		
D5020		Receptacle, 208 V, 3 phase	1985	-9	10 Each	$1,428	$0	$1,428		
D5020		Receptacle, 120 V, 15 Amp.	1970	-24	40 Each	$2,161	$0	$2,161		
D5020		Receptacle, 120 V, 15 Amp.	1995	1	20 Each					
D5020		Receptacle, 120 V, 15 Amp.	1949	-45	100 Each	$5,402	$0	$5,402		
D5020		Receptacle, 120 V, 20 Amp.	1985	-9	20 Each	$2,098	$0	$2,098		
D5020		Receptacle, 120 V, 20 Amp.	1949	-45	10 Each	$1,050	$0	$1,050		
D5030		Fire Alarm Bell, 6"	1970	-24	1 Each	$221	$0	$221		
D5030		Fire Alarm Horn & Strobe	1990	-4	6 Each	$1,065	$0	$1,065		
D5030		Manual Pull Station	1990	-9	5 Each	$758	$0	$758		
D5030		Public Address Speaker	1970	-29	4 Each	$1,340	$0	$1,340		
D5030		Smoke Detector	1990	-9	20 Each	$3,523	$0	$3,523		

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5090		Electric Motor, 75 HP	1949	9	1 Each					
D5090		Generator, Diesel, 175 kw	2002	13	1 Each					
D5090		Meter, Electrical, 208 Volt, 400 Amp.	2005	21	1 Each					
F1030		8x6 Drive Axial Compressor	1949	NA	1 Each					
F1030		8x6 Drive Battery	1949	NA	1 Each					
F1030		8x6 Drive Compressor Lube Oil Purifier	1949	NA	1 Each					
F1030		8x6 Drive CTW Strainer	1949	NA	1 Each					
F1030		8x6 Drive CTW System Valves	1949	NA	1 Each					
F1030		8x6 Drive Downstream Filter Fan	1949	NA	1 Each					
F1030		8x6 Drive DPU4-EQ770 WDPF Cabinet	1949	NA	1 Each					
F1030		8x6 Drive Duplex Controls Panel	1949	NA	1 Each					
F1030		8x6 Drive Dynamic Braking MG System	1949	NA	1 Each					
F1030		8x6 Drive Dynamic Braking Switchgear	1949	NA	1 Each					
F1030		8x6 Drive Electric Cooler Valve	1949	NA	1 Each					
F1030		8x6 Drive Electrolyte Cooler	1949	NA	1 Each					
F1030		8x6 Drive Electrolyte Pump System Valves	1949	NA	1 Each					
F1030		8x6 Drive Electrolyte Pumps	1949	NA	1 Each					
F1030		8x6 Drive Electrolyte System	1949	NA	1 Each					
F1030		8x6 Drive Electrolyte Y-Type Strainer	1949	NA	1 Each					
F1030		8x6 Drive Entrance Oil Cooler	1949	NA	1 Each					
F1030		8x6 Drive Exit Oil Cooler	1949	NA	1 Each					
F1030		8x6 Drive Lift Pump Assembly	1949	NA	1 Each					
F1030		8x6 Drive Liquid Rheostat Pilot Motor	1949	NA	1 Each					
F1030		8x6 Drive Lube Oil Filter	1949	NA	1 Each					
F1030		8x6 Drive Lube Oil Pump/Motor	1949	NA	1 Each					
F1030		8x6 Drive Motor 1 Ring Comp Fan & Motor	1949	NA	1 Each					
F1030		8x6 Drive Motor 2 Ring Comp Fan & Motor	1949	NA	1 Each					
F1030		8x6 Drive Motor 2400V Switchgear	1949	NA	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
F1030		8x6 Drive Motor 3 Ring Comp Fan & Motor	1949	NA	1 Each					
F1030		8x6 Drive Motor Air Cooler	1949	NA	1 Each					
F1030		8x6 Drive Motor Blowers	1949	NA	1 Each					
F1030		8x6 Drive Motor MCE	1949	NA	1 Each					
F1030		8x6 Drive Motor Temp Regulating Valve	1949	NA	1 Each					
F1030		8x6 Drive Motors	1949	NA	1 Each					
F1030		8x6 Drive Oil Purifier	1949	NA	1 Each					
F1030		8x6 Drive Speed Control Duplex Panels	1949	NA	1 Each					
F1030		8x6 Drive Speed Electrolyte Motor	1949	NA	1 Each					
F1030		8x6 Drive Sump Pump	1949	NA	1 Each					
F1030		8x6 Drive Thrust High Pressure Pump Motor	1949	NA	1 Each					
F1030		8x6 Drive Thrust Oil Cooler	1949	NA	1 Each					
F1030		8x6 Low Voltage Meggering Bldg 53	1949	NA	1 Each					
F1030		8x6 Return/Supply Valve Bldg 53	1949	NA	1 Each					
F1030		8x6 Thermography Bldg 53	1949	NA	1 Each					
F1030		8x6 Thermography Bldg 53	1949	NA	1 Each					
F1030		8x6 Turning Gear	1949	NA	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Forecast Year: 2013

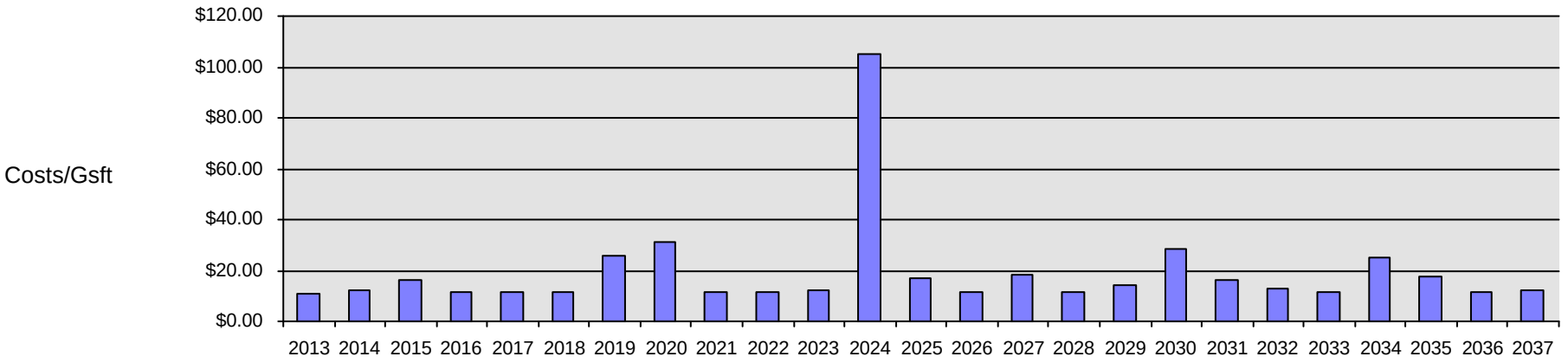
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center 22152 **City:** Cleveland, OH

Forecast Year: 2013

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
A10 Foundations																									
A20 Basement Construction																									
B10 Super Structure																									
B20 Exterior Enclosure	0.01	0.01	0.02	0.01	0.01	0.01	1.27	0.11	0.01	0.01	0.01	16.56	0.40	0.01	0.01	0.01	0.79	0.05	0.01	0.01	0.01	0.49	0.17	0.01	0.01
B30 Roofing	0.06	0.10	0.06	0.06	0.06	0.06	0.25	0.06	0.06	0.06	0.06	2.38	0.06	0.06	0.06	0.06	0.10	0.06	0.06	0.06	0.06	0.10	0.06	0.06	0.06
C10 Interior Construction			0.04	0.02				0.35				0.02	0.04			0.02		0.29		0.02			0.58	0.01	
C20 Stairs	0.04				0.04				0.04			1.39	0.03			0.01	0.03			0.01	0.03			0.01	0.03
C30 Interior Finishes	0.05	0.00				0.11	2.49	0.28	0.05			54.49			0.00	0.00		0.05		0.05		2.41		0.11	0.00
D10 Conveying	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	6.52	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
D20 Plumbing	0.08	0.09	0.18	0.09	0.14	0.10	0.10	0.21	0.07	0.08	0.10	0.26	0.21	0.08	0.06	0.13	0.16	0.30	0.06	0.10	0.16	0.13	0.08	0.16	0.07
D30 HVAC	2.30	2.39	3.93	2.70	2.90	2.43	13.01	17.68	2.81	2.64	2.41	13.87	3.12	2.65	2.59	2.59	3.91	18.17	7.47	3.02	2.46	13.21	5.07	2.47	3.51
D40 Fire Protection			0.02					0.02		0.14					0.02					0.02		0.14			
D50 Electrical	0.50	1.40	4.03	0.53	0.57	0.51	0.52	4.78	0.47	0.52	1.43	1.24	5.15	0.60	7.21	0.52	0.93	1.76	0.48	1.39	0.49	0.54	3.44	0.51	0.49
E10 Equipment																									
E20 Furnishings																									
F10 Special Construction	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93
F20 Selective Bldg Demolition																									
G10 Site Preparation																									
G20 Site Improvements																									
G30 Site Mechanical Utilities																									
G40 Site Electrical Utilities																									
G90 Other Site Construction																									
Total	**11.04**	**11.99**	**16.41**	**11.41**	**11.71**	**11.34**	**25.64**	**31.49**	**11.64**	**11.44**	**12.01**	**######**	**17.01**	**11.40**	**18.07**	**11.34**	**13.92**	**28.79**	**16.08**	**12.69**	**11.33**	**25.02**	**17.40**	**11.45**	**12.17**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 1-25

Based on a 50-Year Forecast.

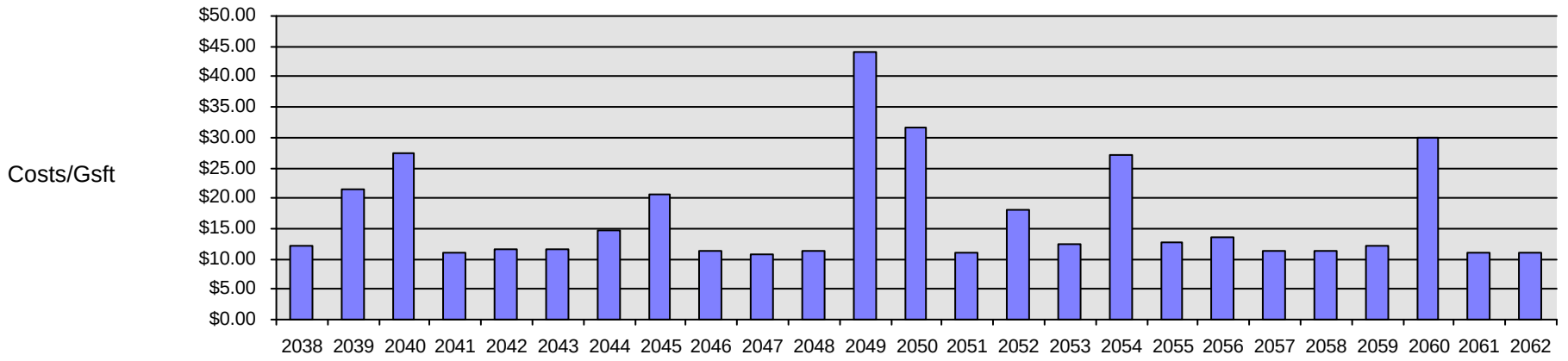
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0053 **GSFT:** 22152

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2	**Total**
A10 Foundations																										**0.00**
A20 Basement Construction																										**0.00**
B10 Super Structure																										**0.00**
B20 Exterior Enclosure	0.01	0.79	0.02	0.01	0.01	0.01	0.53	0.09	0.01	0.01	0.01	8.23	0.04	0.01	0.01	0.01	0.49	0.09	0.01	0.01	0.01	0.79	0.40	0.01	0.01	**31.68**
B30 Roofing	0.06	2.76	0.06	0.06	0.06	0.06	0.12	0.06	0.06	0.06	0.06	0.10	0.06	0.06	0.06	0.06	1.30	0.06	0.06	0.06	0.06	0.25	0.06	0.06	0.06	**9.77**
C10 Interior Construction		0.02	0.25			0.02	0.01	0.23		0.02	0.01		0.11	0.02	0.01			0.24	0.01			0.02	0.15			**2.50**
C20 Stairs		0.07	0.01	0.03			0.09	0.03			0.01	0.78			0.01	0.03	0.02		0.01	0.03			0.01	0.03		**2.85**
C30 Interior Finishes		0.14	0.10				2.42	0.01	0.00		0.05	3.61	0.05				2.66	0.00	0.05				0.05			**69.25**
D10 Conveying	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	6.52	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	**15.97**
D20 Plumbing	0.10	0.09	0.29	0.08	0.09	0.08	0.08	0.09	0.08	0.07	0.14	0.07	0.36	0.13	0.08	0.08	0.11	0.15	0.08	0.07	0.21	0.10	0.22	0.14	0.09	**6.29**
D30 HVAC	3.35	8.23	16.32	2.22	2.69	2.91	2.72	4.33	2.53	2.08	2.49	15.26	18.41	2.12	2.65	2.77	13.84	2.39	4.61	2.49	2.48	2.29	18.50	2.20	2.35	**281.54**
D40 Fire Protection		0.02					0.02		0.14					0.02					0.02		0.14					**0.74**
D50 Electrical	0.62	1.21	2.36	0.57	0.52	0.50	0.61	7.66	0.52	0.58	0.51	1.55	4.72	0.47	7.27	1.43	0.52	1.64	0.62	0.47	0.52	0.59	2.45	0.48	0.60	**78.97**
E10 Equipment																										**0.00**
E20 Furnishings																										**0.00**
F10 Special Construction	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	8.06	7.93	7.93	**398.77**
F20 Selective Bldg Demolition																										**0.00**
G10 Site Preparation																										**0.00**
G20 Site Improvements																										**0.00**
G30 Site Mechanical Utilities																										**0.00**
G40 Site Electrical Utilities																										**0.00**
G90 Other Site Construction																										**0.00**
Total	**12.13**	**21.45**	**27.41**	**10.96**	**11.49**	**11.58**	**14.60**	**20.61**	**11.34**	**10.81**	**11.41**	**44.05**	**31.73**	**10.95**	**18.08**	**12.37**	**27.06**	**12.57**	**13.46**	**11.25**	**11.42**	**12.04**	**29.97**	**10.92**	**11.11**	**898.34**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 26-50

Based on a 50-Year Forecast.

M&R Costs by Task

Whitestone Research

04-Jun-15

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

B20 Exterior Enclosure

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Finish Replaced Steel, 14'x10', Painted, Overhead Coiling Door													177												
Replace Steel, Painted, Exterior, 2nd Floor												105,323													
Finish Replaced Steel, Painted, Exterior, 2nd Floor												10,164													
Repair Steel Operable Window, 24 sf, 1st Fl																									
Replace Steel Operable Window, 24 sf, 1st Fl												53,431													
Repair Steel Operable Window, 24 sf, 2nd Fl																									
Replace Steel Operable Window, 24 sf, 2nd Fl												54,226													
Finish Repaired Steel, Pained, Exterior, 2nd Floor																									
Refinish Steel, 14'x10', Painted, Overhead Coiling Door, Motori								177															177		
Repair Steel, 14'x10', Painted, Overhead Coiling Door, Motoriz								700															700		
Maintain Steel w/ Safety Glass, Painted, Exterior Door Locks			45					45					45					45							
Replace Steel w/ Safety Glass, Painted, Exterior Door Locks								699										699							
Refinish Steel w/ Safety Glass, Painted, Exterior Door								64										64							
Repair Steel w/ Safety Glass, Painted, Exterior Door								407																	
Replace Steel w/ Safety Glass, Painted, Exterior Door																							2,622		
Finish Replaced Steel w/ Safety Glass, Painted, Exterior Door																							64		
Refinish Concrete Block, Painted, Exterior, 1st Floor							7,812										7,812								
Maintain Steel, 14'x10', Painted, Overhead Coiling Door, Motori	105	105	105	105	105	105	105	105	105	105	105	105		105	105	105	105	105	105	105	105	105	105	105	105
Repoint (50% surface) Concrete Block, Painted, Exterior, 2nd F												16,947													
Replace Steel, 14'x10', Painted, Overhead Coiling Door, Motori													8,487												
Repair Steel, Painted, Exterior, 2nd Floor (2% of Walls)																									
Finish Repaired Concrete Block, Painted, Exterior, 1st Floor												157													
Replace Concrete Block, Painted, Exterior, 1st Floor																									
Finish Replaced Concrete Block, Painted, Exterior, 1st Floor																									
Refinish Concrete Block, Painted, Exterior, 2nd Floor							9,436										9,436								
Repair Concrete Block, Painted, Exterior, 2nd Floor (2% of Wall												1,545													
Repoint (50% surface) Concrete Block, Painted, Exterior, 1st Fl												18,626													
Finish Repaired Concrete Block, Painted, Exerior, 2nd Floor												189													
Repair Concrete Block, Painted, Exterior, 1st Floor (2% of Wall												1,836													
Replace Concrete Block, Painted, Exterior, 2nd Floor																									
Finish Replaced Concrete Block, Painted, Exterior, 2nd Floor																									
Refinish Steel, Painted, Exterior, 1st Floor							4,146															4,146			
Repair Steel, Painted, Exterior, 1st Floor (2% of Walls)																									
Finish Repaired Steel, Painted, Exterior, 1st Floor																									
Replace Steel, Painted, Exterior, 1st Floor												96,378													
Finish Replaced Steel, Painted, Exterior, 1st Floor												7,677													

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

B20 Exterior Enclosure

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Finish Replaced Steel, 14'x10', Painted, Overhead Coiling Do																							177		
Replace Steel, Painted, Exterior, 2nd Floor																									
Finish Replaced Steel, Painted, Exterior, 2nd Floor																									
Repair Steel Operable Window, 24 sf, 1st Fl							422																		
Replace Steel Operable Window, 24 sf, 1st Fl																									
Repair Steel Operable Window, 24 sf, 2nd Fl							422																		
Replace Steel Operable Window, 24 sf, 2nd Fl																									
Finish Repaired Steel, Pained, Exterior, 2nd Floor												129													
Refinish Steel, 14'x10', Painted, Overhead Coiling Door, Moto								177										177							
Repair Steel, 14'x10', Painted, Overhead Coiling Door, Motori								700										700							
Maintain Steel w/ Safety Glass, Painted, Exterior Door Locks			45					45					45					45					45		
Replace Steel w/ Safety Glass, Painted, Exterior Door Locks								699										699							
Refinish Steel w/ Safety Glass, Painted, Exterior Door								64										64							
Repair Steel w/ Safety Glass, Painted, Exterior Door													407												
Replace Steel w/ Safety Glass, Painted, Exterior Door																									
Finish Replaced Steel w/ Safety Glass, Painted, Exterior Door																									
Refinish Concrete Block, Painted, Exterior, 1st Floor		7,812																				7,812			
Maintain Steel, 14'x10', Painted, Overhead Coiling Door, Moto	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105		105	105
Repoint (50% surface) Concrete Block, Painted, Exterior, 2nd																									
Replace Steel, 14'x10', Painted, Overhead Coiling Door, Moto																							8,487		
Repair Steel, Painted, Exterior, 2nd Floor (2% of Walls)												2,106													
Finish Repaired Concrete Block, Painted, Exterior, 1st Floor																									
Replace Concrete Block, Painted, Exterior, 1st Floor												84,532													
Finish Replaced Concrete Block, Painted, Exterior, 1st Floor												7,812													
Refinish Concrete Block, Painted, Exterior, 2nd Floor		9,436																				9,436			
Repair Concrete Block, Painted, Exterior, 2nd Floor (2% of W																									
Repoint (50% surface) Concrete Block, Painted, Exterior, 1st																									
Finish Repaired Concrete Block, Painted, Exerior, 2nd Floor																									
Repair Concrete Block, Painted, Exterior, 1st Floor (2% of Wa																									
Replace Concrete Block, Painted, Exterior, 2nd Floor												75,951													
Finish Replaced Concrete Block, Painted, Exterior, 2nd Floor												9,436													
Refinish Steel, Painted, Exterior, 1st Floor							4,146										4,146								
Repair Steel, Painted, Exterior, 1st Floor (2% of Walls)												1,928													
Finish Repaired Steel, Painted, Exterior, 1st Floor												83													
Replace Steel, Painted, Exterior, 1st Floor																									
Finish Replaced Steel, Painted, Exterior, 1st Floor																									

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Refinish Steel, Painted, Exterior, 2nd Floor							6,423															6,423			
B30 Roofing																									
Replace Membrane, Built-up Roof																									
Minor Replacement, Metal Roof (2% of Roof)																									
Repair Metal Roof		567					567										567					567			
Maintain Metal Roof	246	246	246	246	246	246	246	246	246	246	246		246	246	246	246	246	246	246	246	246	246	246	246	246
Replace Metal Roof												25,084													
Place New Membrane Over Existing, Built-up Roof												26,591													
Non-Destructive Moisture Inspection, Built-up Roof		349					349					349					349					349			
Maintain Built-up Roof	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203
Maintain Aluminum Gutter, Downspouts, Fittings	170	170	170	170	170	170		170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Replace Aluminum Gutter, Downspouts, Fittings							3,778																		
C10 Interior Construction																									
Replace Steel, Painted, w/ Safety Glass Interior Door Locks								1,002										1,002							
Refinish Steel, Painted, Interior Door				349				349				349				349				349				64	
Finish Replaced Wood, Solid Core w/ Safety Glass, Painted, Int																									
Replace Wood, Solid Core w/ Safety Glass, Painted, Interior D																									
Replace Wood, Solid Core w/ Safety Glass, Painted, Interior D								667										667							
Maintain Wood, Solid Core w/ Safety Glass, Painted, Interior D			45					45					45					45					45		
Refinish Wood, Solid Core w/ Safety Glass, Painted, Interior Do				64				64				64				64				64				64	
Finish Replaced Steel, Painted, w/ Safety Glass Interior Door																							95		
Replace Steel, Painted, w/ Safety Glass Interior Door																							3,889		
Refinish Steel, Painted, w/ Safety Glass Interior Door				95				95				95				95				95					
Finish Replaced Steel, Painted, Interior Door																							285		
Replace Steel, Painted, Interior Door																							8,380		
Replace Steel, Painted, Interior Door Locks								3,673										3,673							
Maintain Steel, Painted, Interior Door Locks			252					252					252					252					45		
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks			69					69					69					69							
Replace Toilet Partitions, Painted Metal, Overhead Braced								882																	
Refinish Toilet Partitions, Painted Metal, Overhead Braced				31								31				31				31				31	
C20 Stairs																									
Refinish Metal, Painted, Interior Stairs	249				249				249							249				249				249	
Finish Replaced Metal, Painted, Interior Stairs												249													
Replace Metal, Painted, Interior Stairs												7,911													
Repair Metal, Painted, Interior Stairs																									
Finish Replaced Metal, Painted, Interior Railing																									

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Refinish Steel, Painted, Exterior, 2nd Floor							6,423										6,423								
B30 Roofing																									
Replace Membrane, Built-up Roof		56,213																							
Minor Replacement, Metal Roof (2% of Roof)							501																		
Repair Metal Roof		567					567					567					567					567			
Maintain Metal Roof	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246
Replace Metal Roof																									
Place New Membrane Over Existing, Built-up Roof																	26,591								
Non-Destructive Moisture Inspection, Built-up Roof							349					349					349					349			
Maintain Built-up Roof	203		203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203
Maintain Aluminum Gutter, Downspouts, Fittings	170		170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170		170	170	170
Replace Aluminum Gutter, Downspouts, Fittings		3,778																				3,778			
C10 Interior Construction																									
Replace Steel, Painted, w/ Safety Glass Interior Door Locks								1,002										1,002							
Refinish Steel, Painted, Interior Door		285	64			285	64			285	64			285	64			285	64			285	64		
Finish Replaced Wood, Solid Core w/ Safety Glass, Painted, I			64																						
Replace Wood, Solid Core w/ Safety Glass, Painted, Interior			2,912																						
Replace Wood, Solid Core w/ Safety Glass, Painted, Interior													667										667		
Maintain Wood, Solid Core w/ Safety Glass, Painted, Interior								45					45					45					45		
Refinish Wood, Solid Core w/ Safety Glass, Painted, Interior							64				64				64				64				64		
Finish Replaced Steel, Painted, w/ Safety Glass Interior Door																									
Replace Steel, Painted, w/ Safety Glass Interior Door																									
Refinish Steel, Painted, w/ Safety Glass Interior Door		95				95				95				95				95				95			
Finish Replaced Steel, Painted, Interior Door																									
Replace Steel, Painted, Interior Door																									
Replace Steel, Painted, Interior Door Locks			667					3,006					667					3,006					667		
Maintain Steel, Painted, Interior Door Locks			252					252					252					252					252		
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks			69					69					69					69					69		
Replace Toilet Partitions, Painted Metal, Overhead Braced			882																				882		
Refinish Toilet Partitions, Painted Metal, Overhead Braced							31				31				31				31						
C20 Stairs																									
Refinish Metal, Painted, Interior Stairs			249				249				249				249				249				249		
Finish Replaced Metal, Painted, Interior Stairs																									
Replace Metal, Painted, Interior Stairs																									
Repair Metal, Painted, Interior Stairs		525															525								
Finish Replaced Metal, Painted, Interior Railing												687													

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Finish Repaired Metal, Painted, Interior Railing												21													
Repair Metal, Painted, Interior Railing												995													
Refinish Metal, Painted, Interior Railing	687				687				687				687				687				687				687
Replace Concrete, Interior Stairs												21,668													
Repair Concrete, Interior Stairs																									
Replace Metal, Painted, Interior Railing																									
Finish Repaired Metal, Painted, Interior Stairs																									

C30 Interior Finishes

Repair Concrete, Painted Flooring (2% of Floors)																									
Repair Acoustic Tile Ceiling (2% of Ceiling)																35									35
Replace Vinyl Tile Flooring						2,501																	2,501		
Repair Vinyl Tile Flooring (2% of Floors)		37													37										
Replace Steel Flooring												12,471													
Repair Steel Flooring (2% of Walls)																									
Finish Replaced Concrete, Painted Flooring												14,044													
Replace Concrete, Painted Flooring												141,560													
Finish Repaired Concrete, Painted Flooring																									
Replace Acoustic Tile Ceiling							1,710																		
Replace Metal Ceiling												61,120													
Refinish Concrete, Painted Flooring							14,044															14,044			
Repair Concrete Ceiling (2% of Ceiling)																									
Replace Concrete Ceiling												87,596													
Refinish Concrete, Painted Ceiling							17,133															17,133			
Finish Repaired Concrete, Painted Ceiling																									
Finish Replaced Concrete, Painted Ceiling												17,133													
Refinish Gypsum Board, Finished Ceiling							151															151			
Repair Gypsum Board, Finished Ceiling (2% of Ceiling)																									
Finish Repaired Gypsum Board, Finished Ceiling																									
Replace Gypsum Board, Finished Ceiling												528													
Repair Metal Ceiling (2% of Ceiling)	1,215								1,215											1,215					
Repair Concrete, Painted Ceiling (2% of Ceiling)																									
Finish Replaced Steel, Painted, Interior Wall Finish												4,287													
Finish Replaced Gypsum Board, Finished Ceiling												151													
Replace Concrete Block, Painted, Interior Wall Finish												247,177													
Repair Steel Fixed Window, 24 sf, Interior																									
Replace Steel Fixed Window, 24 sf, Interior												7,608													
Refinish Acoustical Tile, Painted, Interior Wall Finish																		1,010							

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Finish Repaired Metal, Painted, Interior Railing		21																							
Repair Metal, Painted, Interior Railing		995																							
Refinish Metal, Painted, Interior Railing				687				687								687				687				687	
Replace Concrete, Interior Stairs																									
Repair Concrete, Interior Stairs							1,698																		
Replace Metal, Painted, Interior Railing												16,655													
Finish Repaired Metal, Painted, Interior Stairs		8															8								

C30 Interior Finishes

Repair Concrete, Painted Flooring (2% of Floors)		2,831															2,831								
Repair Acoustic Tile Ceiling (2% of Ceiling)									35									35							
Replace Vinyl Tile Flooring																	2,501								
Repair Vinyl Tile Flooring (2% of Floors)								37																	
Replace Steel Flooring																									
Repair Steel Flooring (2% of Walls)												804													
Finish Replaced Concrete, Painted Flooring																									
Replace Concrete, Painted Flooring																									
Finish Repaired Concrete, Painted Flooring		282															282								
Replace Acoustic Tile Ceiling																									
Replace Metal Ceiling																									
Refinish Concrete, Painted Flooring							14,044										14,044								
Repair Concrete Ceiling (2% of Ceiling)												1,744													
Replace Concrete Ceiling																									
Refinish Concrete, Painted Ceiling							17,133										17,133								
Finish Repaired Concrete, Painted Ceiling												342													
Finish Replaced Concrete, Painted Ceiling																									
Refinish Gypsum Board, Finished Ceiling							151										151								
Repair Gypsum Board, Finished Ceiling (2% of Ceiling)												11													
Finish Repaired Gypsum Board, Finished Ceiling												3													
Replace Gypsum Board, Finished Ceiling																									
Repair Metal Ceiling (2% of Ceiling)			1,215								1,215								1,215						
Repair Concrete, Painted Ceiling (2% of Ceiling)												5,694													
Finish Replaced Steel, Painted, Interior Wall Finish																									
Finish Replaced Gypsum Board, Finished Ceiling																									
Replace Concrete Block, Painted, Interior Wall Finish																									
Repair Steel Fixed Window, 24 sf, Interior							168																		
Replace Steel Fixed Window, 24 sf, Interior																									
Refinish Acoustical Tile, Painted, Interior Wall Finish			1,010										1,010										1,010		

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Acoustical Tile, Painted, Interior Wall Finish (2% of Wall																									
Finish Repaired Acoustical Tile, Painted, Interior Wall Finish																									
Replace Acoustical Tile, Painted, Interior Wall Finish								5,236																	
Finish Replaced Acoustical Tile, Painted, Interior Wall Finish								1,010																	
Replace Steel, Painted, Interior Wall Finish												53,241													
Refinish Concrete Block, Painted, Interior Wall Finish							18,949															18,949			
Repair Steel Fixed Window, 12 sf, Interior																									
Repair Concrete Block, Painted, Interior Wall Finish (2% of Wal																									
Replace Concrete, Painted Ceiling												287,978													
Finish Repaired Concrete Block, Painted, Interior Wall Finish																									
Replace Steel Fixed Window, 12 sf, Interior												2,190													
Finish Replaced Concrete Block, Painted, Interior Wall Finish												18,949													
Refinish Concrete, Painted, Interior Wall Finish							947															947			
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)																									
Finish Repaired Concrete, Painted, Interior Wall Finish																									
Replace Concrete, Painted, Interior Wall Finish												24,615													
Finish Replaced Concrete, Painted, Interior Wall Finish												947													
Repair Steel, Interior Wall Finish (2% of Walls)																									
Replace Steel, Interior Wall Finish												225,364													
Refinish Steel, Painted, Interior Wall Finish							2,183															2,183			
Repair Steel, Painted, Interior Wall Finish (2% of Walls)																									
Finish Repaired Steel, Painted, Interior Wall Finish																									
Repoint (50% surface) Concrete Block, Painted, Interior Wall Fi																									
D10 Conveying																									
Maintain Bridge Crane, Overhead, 30 Ton	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Replace Bridge Crane, Overhead, 30 Ton												144,407													
D20 Plumbing																									
Drain & Flush Water Heater, Electric, 52 Gal.					350							350								350					
Replace 10' Section, Pipe & Fittings, 2" Copper, Cold Water								43																	
Replace Pipe & Fittings, 2" Copper, Cold Water (20% of Pipe)													854												
Replace 10' Section, Pipe & Fittings, 3/4" Steel									9															9	
Install New Gasket & Bolts, Pipe & Fittings, 3/4" Steel																									
Replace Pipe & Fittings, 3/4" Steel (20% of Pipe)												184													
Replace 10' Section, Pipe & Fittings, 1" Steel									28															28	
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel																									
Replace Pipe & Fittings, 1" Steel (20% of Pipe)												570													

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Acoustical Tile, Painted, Interior Wall Finish (2% of W								105																	
Finish Repaired Acoustical Tile, Painted, Interior Wall Finish								21																	
Replace Acoustical Tile, Painted, Interior Wall Finish																									
Finish Replaced Acoustical Tile, Painted, Interior Wall Finish																									
Replace Steel, Painted, Interior Wall Finish																									
Refinish Concrete Block, Painted, Interior Wall Finish							18,949										18,949								
Repair Steel Fixed Window, 12 sf, Interior							84																		
Repair Concrete Block, Painted, Interior Wall Finish (2% of W												4,943													
Replace Concrete, Painted Ceiling																									
Finish Repaired Concrete Block, Painted, Interior Wall Finish												380													
Replace Steel Fixed Window, 12 sf, Interior																									
Finish Replaced Concrete Block, Painted, Interior Wall Finish																									
Refinish Concrete, Painted, Interior Wall Finish							947										947								
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)												487													
Finish Repaired Concrete, Painted, Interior Wall Finish												19													
Replace Concrete, Painted, Interior Wall Finish																									
Finish Replaced Concrete, Painted, Interior Wall Finish																									
Repair Steel, Interior Wall Finish (2% of Walls)												5,651													
Replace Steel, Interior Wall Finish																									
Refinish Steel, Painted, Interior Wall Finish							2,183										2,183								
Repair Steel, Painted, Interior Wall Finish (2% of Walls)												1,058													
Finish Repaired Steel, Painted, Interior Wall Finish												43													
Repoint (50% surface) Concrete Block, Painted, Interior Wall												58,698													

D10 Conveying

Maintain Bridge Crane, Overhead, 30 Ton	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Replace Bridge Crane, Overhead, 30 Ton												144,407													

D20 Plumbing

Drain & Flush Water Heater, Electric, 52 Gal.		350								350							350								350
Replace 10' Section, Pipe & Fittings, 2" Copper, Cold Water								43																	
Replace Pipe & Fittings, 2" Copper, Cold Water (20% of Pipe)													854												
Replace 10' Section, Pipe & Fittings, 3/4" Steel											9												9		
Install New Gasket & Bolts, Pipe & Fittings, 3/4" Steel												8													
Replace Pipe & Fittings, 3/4" Steel (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 1" Steel											28												28		
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel												23													
Replace Pipe & Fittings, 1" Steel (20% of Pipe)																									

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Re-tape Pipe Insulation, Fiberglass, Cold Water		42					42										42					42			
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insula												144													
Re-tape Pipe Insulation, Fiberglass, Hot Water		14					14										14					14			
Replace Pump & Motor Assembly, Sump Pump, 1/2 HP																1,436									
Check Operation, Water Heater, Electric, 52 Gal.	29			29			29			29						29			29			29			29
Maintain Floor Drain	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272
Replace Floor Drain																	2,620								
Replace 10' Section, Pipe & Fittings, 3" Cast Iron									117															117	
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron																									
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)												2,336													
Maintain Roof Drain, 4-6"	69	69	69	69	69	69		69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Replace Roof Drain, 4-6"							1,128																		
Inspect & Lubricate Sump Pump, 1/2 HP	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98		98	98	98	98	98	98	98	98	98
Overhaul Sump Pump, 1/2 HP	199					199					199										199				
Resolder Joint, Pipe & Fittings, 2" Copper, Cold Water								39															39		
Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insulati												48													
Replace Emergency Eye Wash & Shower Station																					1,606			1,606	
Replace Gate Valve, 2-3"					1,161							581										1,161			
Replace Water Heater, Electric, 52 Gal.													2,127												
Replace Coolant & Adjust Drinking Fountain, Refrigerated		35		35		35				35		35		35		35				35		35		35	
Replace Coolant & Adjust Water Cooler, Electric		35		35		35				35		35		35		35				35		35		35	
Replace Drinking Fountain, Refrigerated								1,064										1,064							
Replace Water Cooler, Electric								1,271										1,271							
Repack Valve Glands, Emergency Eye Wash & Shower Station						70			70							70			70						
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chin		58		58		58		58		58		58		58		58				58		58		58	
Replace Washer & Spud Connection, Lavatory, Vitreous China				94							94														94
Replace Valve Set, Lavatory, Vitreous China								296																	
Replace Lavatory, Vitreous China																		1,004							
Replace Faucet Washer & Clean Trap, Sink, Iron, Enamel		29		29		29		29		29		29		29		29				29		29		29	
Replace Shower, Enameled Steel			2,031																						
Inspect & Clean Emergency Eye Wash & Shower Station		114			114			114			114			114			114			114			57	57	
Replace Urinal, Vitreous China																		945							
Repair Strainer, Sink, Iron, Enamel				84								84													
Replace Flush Valve, Urinal, Vitreous China				161							161														161
Replace Flush Valve, Tankless Water Closet													29										29		
Replace Valve Set, Shower, Enameled Steel													179										179		
Repack Gland, Gate Valve, 2-3"		63		125						63			125							63	125				

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Re-tape Pipe Insulation, Fiberglass, Cold Water		42					42										42					42			
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insul												144													
Re-tape Pipe Insulation, Fiberglass, Hot Water		14					14										14					14			
Replace Pump & Motor Assembly, Sump Pump, 1/2 HP											1,436														
Check Operation, Water Heater, Electric, 52 Gal.						29			29			29			29						29			29	
Maintain Floor Drain	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272
Replace Floor Drain																									
Replace 10' Section, Pipe & Fittings, 3" Cast Iron											117												117		
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron												48													
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)																									
Maintain Roof Drain, 4-6"	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69		69	69	69
Replace Roof Drain, 4-6"																						1,128			
Inspect & Lubricate Sump Pump, 1/2 HP	98	98	98	98	98	98	98	98	98	98		98	98	98	98	98	98	98	98	98	98	98	98	98	98
Overhaul Sump Pump, 1/2 HP	199					199										199					199				
Resolder Joint, Pipe & Fittings, 2" Copper, Cold Water								39															39		
Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insula												48													
Replace Emergency Eye Wash & Shower Station																					1,606			1,606	
Replace Gate Valve, 2-3"				581										1,161							581				
Replace Water Heater, Electric, 52 Gal.			2,127															2,127							
Replace Coolant & Adjust Drinking Fountain, Refrigerated	35				35		35		35		35				35		35		35		35				35
Replace Coolant & Adjust Water Cooler, Electric	35				35		35		35		35				35		35		35		35				35
Replace Drinking Fountain, Refrigerated			1,064										1,064										1,064		
Replace Water Cooler, Electric			1,271										1,271										1,271		
Repack Valve Glands, Emergency Eye Wash & Shower Statio						70			70							70			70						
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chi	58		58		58		58		58		58		58		58		58		58		58		58		58
Replace Washer & Spud Connection, Lavatory, Vitreous Chin							94							94							94				
Replace Valve Set, Lavatory, Vitreous China			296										296										296		
Replace Lavatory, Vitreous China																									
Replace Faucet Washer & Clean Trap, Sink, Iron, Enamel	29		29		29		29		29		29		29		29		29		29		29		29		29
Replace Shower, Enameled Steel													2,031												
Inspect & Clean Emergency Eye Wash & Shower Station		114			114			114			114			114			114			114			57	57	
Replace Urinal, Vitreous China																									
Repair Strainer, Sink, Iron, Enamel	84								84								84								84
Replace Flush Valve, Urinal, Vitreous China							161							161							161				
Replace Flush Valve, Tankless Water Closet								29															29		
Replace Valve Set, Shower, Enameled Steel								179															179		
Repack Gland, Gate Valve, 2-3"			63		125							63	125							63		125			

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Reseal Shower, Enameled Steel								56					56					56					56		
Replace Faucet Washer & Clean Shower Head, Enameled Stee		29			29		29		29		29		29		29		29		29		29		29		29
Replace Service Sink, Iron, Enamel																		1,089							
Replace Valve Set, Service Sink, Iron, Enamel								148																	
Replace Tankless Water Closet			691																						
D30 HVAC																									
Replace Pipe & Fittings, 6" Steel (20% of Pipe)												1,921													
Replace Pipe & Fittings, 18" Steel (20% of Pipe)												15,615													
Replace Flow Control Valve, Motorized, 2"															1,665										
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel																									
Replace 10' Section, Pipe & Fittings, 6" Steel									95															95	
Replace Valve Actuator, 2"	1,190										1,190														1,190
Maintain Flow Control Valve & Actuator, 2"	107	107	107	107	107	107	107	107	107	107	107	107	107	107		107	107	107	107	107	107	107	107	107	107
Replace Condensate Receiver Station, 10-15 Gal.									6,956												6,956				
Repair Condensate Receiver Station, Motor, 10-15 Gal.	1,969				1,969								1,969				1,969								1,969
Maintain Condensate Receiver Station, 10-15 Gal.	87	87	87	87	87	87	87	87		87	87	87	87	87	87	87	87	87	87	87		87	87	87	87
Repack Gland, Gate Valve, 2-3"	63			1,259	63			252	63		63					1,259			63	63	252				
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel													60												
Repair Condensate Receiver Station, 10-15 Gal.	523		523		523		523				523		523		523		523		523				523		523
Replace Gate Valve, 2-3"			581					11,626			581	581	2,325					581					11,626		
Repack Gland, Gate Valve, 6"		252														252									
Replace Gate Valve, 6"								10,738															10,738		
Repack Gland, Gate Valve, 20"	126								126		63									126					
Replace Gate Valve, 20"			39,734									79,467						39,734							
Resolder Joint, Pipe & Fittings, 2" Copper								411										283					129		
Replace 10' Section, Pipe & Fittings, 2" Copper								457																	
Replace Pipe & Fittings, 2" Copper (20% of Pipe)													2,856										6,281		
Replace 10' Section, Pipe & Fittings, 1" Steel								239	210			95								239				305	
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel													77												
Install New Gasket & Bolts, Pipe & Fittings, 18" Steel																									
Replace 10' Section, Pipe & Fittings, 4" Steel									153			127												281	
Resolder Joint, Pipe & Fittings, 2" Copper, Fuel Oil							180	669										283				180	386		
Install New Gasket & Bolts, Pipe & Fittings, 10" Steel																									
Replace Pipe & Fittings, 1" Steel (20% of Pipe)												4,195											4,767		
Replace Oil Storage Tank Steel, 1,500 Gal.				6,906																					
Replace 10' Section, Pipe & Fittings, 10" Steel									107															107	
Maintain Oil Pump, 3 HP	391	586	586	586	586	586	586	586	586	586	586	195	586	391	586	586	586	586	586	586	586	586	586	586	195

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Reseal Shower, Enameled Steel			56					56										56					56		
Replace Faucet Washer & Clean Shower Head, Enameled St		29		29		29		29		29		29			29		29		29		29		29		29
Replace Service Sink, Iron, Enamel																									
Replace Valve Set, Service Sink, Iron, Enamel			148										148										148		
Replace Tankless Water Closet													691												
D30 HVAC																									
Replace Pipe & Fittings, 6" Steel (20% of Pipe)																									
Replace Pipe & Fittings, 18" Steel (20% of Pipe)																									
Replace Flow Control Valve, Motorized, 2"							1,665																	1,665	
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel												49													
Replace 10' Section, Pipe & Fittings, 6" Steel											95												95		
Replace Valve Actuator, 2"																	1,190								
Maintain Flow Control Valve & Actuator, 2"	107	107	107	107	107	107		107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107		107
Replace Condensate Receiver Station, 10-15 Gal.								6,956												6,956					
Repair Condensate Receiver Station, Motor, 10-15 Gal.				1,969								1,969				1,969								1,969	
Maintain Condensate Receiver Station, 10-15 Gal.	87	87	87	87	87	87	87		87	87	87	87	87	87	87	87	87	87	87		87	87	87	87	87
Repack Gland, Gate Valve, 2-3"	63					1,259			63	63	252					63					1,259			63	63
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel												72	60												
Repair Condensate Receiver Station, 10-15 Gal.		523		523		523				523		523		523		523		523				523		523	
Replace Gate Valve, 2-3"	581	581	2,325					581					11,626			581	581	2,325					581		
Repack Gland, Gate Valve, 6"						252															252				
Replace Gate Valve, 6"													10,738												
Repack Gland, Gate Valve, 20"	63									126						63									126
Replace Gate Valve, 20"		79,467						39,734									79,467						39,734		
Resolder Joint, Pipe & Fittings, 2" Copper								411										283					129		
Replace 10' Section, Pipe & Fittings, 2" Copper								143										314							
Replace Pipe & Fittings, 2" Copper (20% of Pipe)													2,856										6,281		
Replace 10' Section, Pipe & Fittings, 1" Steel										239	305											239	305		
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel												167	77										190		
Install New Gasket & Bolts, Pipe & Fittings, 18" Steel												64													
Replace 10' Section, Pipe & Fittings, 4" Steel											281												281		
Resolder Joint, Pipe & Fittings, 2" Copper, Fuel Oil							180	669										283				180	386		
Install New Gasket & Bolts, Pipe & Fittings, 10" Steel												32													
Replace Pipe & Fittings, 1" Steel (20% of Pipe)																									
Replace Oil Storage Tank Steel, 1,500 Gal.					6,906																				
Replace 10' Section, Pipe & Fittings, 10" Steel											107												107		
Maintain Oil Pump, 3 HP	586	391	586	586	586	586	586	586	586	586	586	586	195	586	391	586	586	586	586	586	586	586	586	586	586

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Oil Pump, 3 HP						2,297				1,148											2,297		1,148		
Replace Oil Pump, 3 HP												13,974		6,987											13,974
Maintain Oil Pump, 10 HP	309	309	309	309		309	309	309	309	309	309	309	309	309	309	309	309		309	309	309	309	309	309	309
Repair Oil Pump, 10 HP		1,013		1,013										2,026											
Replace Oil Pump, 10 HP					13,686													13,686							
Maintain Oil Storage Tank, 30 Gal.	346	346	346	346	346	346		346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346
Replace Oil Storage Tank, 30 Gal.							634																		
Maintain Oil Storage Tank, 275 Gal.	273	273	273	273	273	273		273	273	273	273	273	273	273	273	273	273	273	273	273	273	273	273	273	273
Replace Oil Storage Tank, 275 Gal.							799																		
Replace Pipe & Fittings, 2" Copper, Fuel Oil (20% of Pipe)												3,997	8,565										6,281		
Maintain Oil Storage Tank, 550 Gal.	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187
Replace 10' Section, Pipe & Fittings, 18" Steel									781															781	
Replace Oil Storage Tank, 550 Gal.																									
Replace 10' Section, Pipe & Fittings, 2" Copper, Fuel Oil								743																	
Replace 10' Section, Pipe & Fittings, 2" Steel, Gas/Oil								64				141								64				141	
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel, Gas/Oil													84												
Replace Pipe & Fittings, 2" Steel, Gas/Oil (20% of Pipe)																							1,369		
Replace 10' Section, Pipe & Fittings, 4" Steel, Fuel Oil								280												280					
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel, Fuel Oil																									
Replace Pipe & Fittings, 4" Steel, Fuel Oil (20% of Pipe)																							5,590		
Maintain Oil Tank, 10 Gal.	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Replace Oil Tank, 10 Gal.																									
Lubricate, Repack Gland, Ball Valve, 4"	410	410	410	410	410	410	410	410	410	410		410	410	410	410	410	410	410	410	410	410	410	410	410	410
Replace Ball Valve, 4"											4,309														
Maintain Oil Storage Tank Steel, 1,500 Gal.	297	297	297		297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297
Maintain Air Handler, Single Zone, 2,500 Cfm	484	484	484	484	484	484	484	484		484	484	484	484	484	484	484	484	484	484	484	484	484	484	484	
Replace Gate Valve, 6"								2,685															2,685		
Repair Exhaust Fan, Propeller, 1,000 Cfm								264												264					
Replace Exhaust Fan, Centrifugal, 100,000 Cfm							243,729															243,729			
Maintain Exhaust Fan, Centrifugal, 100,000 Cfm	853	853	853	853	853	853		853	853	853	853	853	853	853	853	853	853	853	853	853	853		853	853	853
Replace Exhaust Fan, Centrifugal, 2,000 Cfm													2,041												
Repair Exhaust Fan, Centrifugal, 2,000 Cfm				264																		264			
Maintain Exhaust Fan, Centrifugal, 2,000 Cfm	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123
Replace Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm													863												
Maintain Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm	66	66	66	66	66	66	66	66	66	66	66	66		66	66	66	66	66	66	66	66	66	66	66	66
Replace Existing Ductwork (20% of Ductwork)														676					1,690						1,126
Maintain Residential Type Ceiling Fan	351	351	351	351	351	351	351		351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Oil Pump, 3 HP									2,297		1,148											2,297		1,148	
Replace Oil Pump, 3 HP		6,987											13,974		6,987										
Maintain Oil Pump, 10 HP	309	309	309	309	309		309	309	309	309	309	309	309	309	309	309	309	309		309	309	309	309	309	309
Repair Oil Pump, 10 HP		2,026													2,026										
Replace Oil Pump, 10 HP						13,686													13,686						
Maintain Oil Storage Tank, 30 Gal.	346	346	346	346	346	346	346		346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346
Replace Oil Storage Tank, 30 Gal.								634																	
Maintain Oil Storage Tank, 275 Gal.	273	273	273	273	273	273	273		273	273	273	273	273	273	273	273	273	273	273	273	273	273	273	273	273
Replace Oil Storage Tank, 275 Gal.								799																	
Replace Pipe & Fittings, 2" Copper, Fuel Oil (20% of Pipe)												3,997	8,565										6,281		
Maintain Oil Storage Tank, 550 Gal.		1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187	1,187
Replace 10' Section, Pipe & Fittings, 18" Steel											781												781		
Replace Oil Storage Tank, 550 Gal.	19,867																								
Replace 10' Section, Pipe & Fittings, 2" Copper, Fuel Oil							200	429										314							
Replace 10' Section, Pipe & Fittings, 2" Steel, Gas/Oil										64	141											64	141		
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel, Gas/Oil													84										38		
Replace Pipe & Fittings, 2" Steel, Gas/Oil (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 4" Steel, Fuel Oil										280												280			
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel, Fuel Oil																							133		
Replace Pipe & Fittings, 4" Steel, Fuel Oil (20% of Pipe)																									
Maintain Oil Tank, 10 Gal.	29	29	29	29	29		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Replace Oil Tank, 10 Gal.						837																			
Lubricate, Repack Gland, Ball Valve, 4"		410	410	410	410	410	410	410	410	410	410	410	410	410	410		410	410	410	410	410	410	410	410	410
Replace Ball Valve, 4"	4,309															4,309									
Maintain Oil Storage Tank Steel, 1,500 Gal.	297	297	297	297		297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297
Maintain Air Handler, Single Zone, 2,500 Cfm	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484		484	484	484	484	484	484	484	484	484
Replace Gate Valve, 6"													2,685												
Repair Exhaust Fan, Propeller, 1,000 Cfm										264															264
Replace Exhaust Fan, Centrifugal, 100,000 Cfm												243,729													
Maintain Exhaust Fan, Centrifugal, 100,000 Cfm	853	853	853	853	853	853	853	853	853	853	853		853	853	853	853	853	853	853	853	853	853	853	853	853
Replace Exhaust Fan, Centrifugal, 2,000 Cfm			2,041															2,041							
Repair Exhaust Fan, Centrifugal, 2,000 Cfm												264													
Maintain Exhaust Fan, Centrifugal, 2,000 Cfm	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123
Replace Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm			863															863							
Maintain Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm	66	66		66	66	66	66	66	66	66	66	66	66	66	66	66	66		66	66	66	66	66	66	66
Replace Existing Ductwork (20% of Ductwork)															676					1,690					
Maintain Residential Type Ceiling Fan	351	351		351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351		351	351

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Air Handler, Single Zone, 2,500 Cfm				2,046																2,046					
Replace Residential Type Ceiling Fan								984																	
Replace Valve, Non-Drain, 16"								10,318				10,318											10,318		
Maintain Strainer, Cast Iron, 16"	114	114	114	114	114	114	114	57	114	114	114	57	114	114	114	114	114	114	114	114	114	114	57	114	114
Replace Water Storage Tank, 750 Gal.																	42,729								
Maintain Water Storage Tank, 750 Gal.	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487		1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487
Replace Gate Valve, 14"												16,924													
Repack Gland, Gate Valve, 14"	63								63											63					
Replace Gate Valve, 10"												10,679													
Repack Gland, Gate Valve, 10"	126								126											126					
Replace Gate Valve, 8"												7,407													
Repack Gland, Gate Valve, 8"	126								126											126					
Replace Air Handler, Single Zone, 2,500 Cfm									9,474																9,474
Repair Unit Heater, 12 Mbh																					1,062				
Replace Pipe & Fittings, 4" Steel (20% of Pipe)												3,056													
Replace Thermostat			808					1,615					808					1,615					808		
Maintain Thermostat	174	174	116	174	174	174	174	58	174	174	174	174	116	174	174	174	174	58	174	174	174	174	116	174	174
Replace HVAC Control Panel												3,662													
Minor Repair, HVAC Control Panel		259					259										259					259			
Inspect & Maintain HVAC Control Panel	70	70	70	70	70	70	70	70	70	70	70		70	70	70	70	70	70	70	70	70	70	70	70	70
Replace Direct Digital Controls, System Points								317,516										317,516							
Monitor Direct Digital Controls, System Points	13,206	13,206	13,206	13,206	13,206	13,206	13,206		13,206	13,206	13,206	13,206	13,206	13,206	13,206	13,206	13,206		13,206	13,206	13,206	13,206	13,206	13,206	13,206
Replace Unit Heater, 36 Mbh										7,584		2,528													
Repair Unit Heater, 36 Mbh								1,350																	
Replace Exhaust Fan, Propeller, 1,000 Cfm											1,183														
Replace Unit Heater, 12 Mbh	1,522																								
Repair Exhaust Fan, Centrifugal, 100,000 Cfm					4,199											4,199									
Maintain Unit Heater, 12 Mbh		323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323
Replace Air Conditioner, Rooftop, Single Zone, 5 Ton																									8,312
Repair Air Conditioner, Rooftop, Single Zone, 5 Ton													2,516												
Maintain Air Conditioner, Rooftop, Single Zone, 5 Ton	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	
Replace Ventilator, 12"															1,170										
Replace Steel Damper, Motorized, w/ Actuator								5,279																	
Refinish Steel Damper, Motorized, w/ Actuator																		351							
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Actu			152										152					152					152		
Refinish Steel Damper, Motorized			140										140										140		
Clean, Lubricate, and Inspect Steel Damper, Motorized			60					60					60					60					60		

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Air Handler, Single Zone, 2,500 Cfm											2,046														
Replace Residential Type Ceiling Fan			984																				984		
Replace Valve, Non-Drain, 16"		10,318											10,318				10,318								
Maintain Strainer, Cast Iron, 16"	114	57	114	114	114	114	114	114	114	114	114	114	57	114	114	114	57	114	114	114	114	114	114	114	114
Replace Water Storage Tank, 750 Gal.												42,729													
Maintain Water Storage Tank, 750 Gal.	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487		1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487	1,487
Replace Gate Valve, 14"		16,924															16,924								
Repack Gland, Gate Valve, 14"										63															63
Replace Gate Valve, 10"		10,679															10,679								
Repack Gland, Gate Valve, 10"										126															126
Replace Gate Valve, 8"		7,407															7,407								
Repack Gland, Gate Valve, 8"										126															126
Replace Air Handler, Single Zone, 2,500 Cfm																9,474									
Repair Unit Heater, 12 Mbh																									
Replace Pipe & Fittings, 4" Steel (20% of Pipe)																									
Replace Thermostat			1,615					808					1,615					808					1,615		
Maintain Thermostat	174	174	58	174	174	174	174	116	174	174	174	174	58	174	174	174	174	116	174	174	174	174	58	174	174
Replace HVAC Control Panel		3,662															3,662								
Minor Repair, HVAC Control Panel							259					259										259			
Inspect & Maintain HVAC Control Panel	70		70	70	70	70	70	70	70	70	70	70	70	70	70	70		70	70	70	70	70	70	70	70
Replace Direct Digital Controls, System Points			317,516										317,516										317,516		
Monitor Direct Digital Controls, System Points	13,206	13,206		13,206	13,206	13,206	13,206	13,206	13,206	13,206	13,206	13,206		13,206	13,206	13,206	13,206	13,206	13,206	13,206	13,206	13,206		13,206	13,206
Replace Unit Heater, 36 Mbh																	7,584		2,528						
Repair Unit Heater, 36 Mbh					4,049		1,350																		
Replace Exhaust Fan, Propeller, 1,000 Cfm	1,183															1,183									
Replace Unit Heater, 12 Mbh								1,522																	
Repair Exhaust Fan, Centrifugal, 100,000 Cfm						4,199															4,199				
Maintain Unit Heater, 12 Mbh	323	323	323	323	323	323	323		323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323
Replace Air Conditioner, Rooftop, Single Zone, 5 Ton																									
Repair Air Conditioner, Rooftop, Single Zone, 5 Ton																				2,516					
Maintain Air Conditioner, Rooftop, Single Zone, 5 Ton	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647
Replace Ventilator, 12"																1,170									
Replace Steel Damper, Motorized, w/ Actuator			5,279																				5,279		
Refinish Steel Damper, Motorized, w/ Actuator													351												
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Act								152					152					152							
Refinish Steel Damper, Motorized								140										140							
Clean, Lubricate, and Inspect Steel Damper, Motorized			60					60					60					60					60		

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Maintain Unit Heater, 36 Mbh	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	323	1,292	969	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292
Install New Gasket & Bolts, Pipe & Fittings, 18" Steel																									
Replace Flow Control Valve, Motorized, 8"																									
Replace Valve Actuator, 8"																									
Maintain Flow Control Valve & Actuator, 8"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Flow Control Valve, Motorized, 6"																				15,168					
Replace Valve Actuator, 6"												14,684													
Maintain Flow Control Valve & Actuator, 6"	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324		324	324	324	324	324
Replace Circulation Pump, 50 HP, Chiller & Condenser Water												38,311													
Repair Circulation Pump, 50 HP, Chiller & Condenser Water																									
Maintain Circulation Pump, 50 HP, Chiller & Condenser Water	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123
Replace Check Valve, 8"															10,249										
Maintain Heat Exchanger, Plate/frame	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105		105	105	105	105	105	105
Replace Pipe & Fittings, 18" Steel (20% of Pipe)												14,053													
Maintain Steam Trap, F&T, 1"	440	352	616	440	616	616	616	616	440	352	616	440	616	616	616	616	440	352	616	440	616	616	616	616	440
Replace 10' Section, Pipe & Fittings, 18" Steel									703															703	
Replace Steam Trap, F&T, 2"		5,843								5,843								5,843							
Replace Steam Trap, F&T, 1"	1,477	2,216		1,477					1,477	2,216		1,477					1,477	2,216		1,477					1,477
Repair Steam Trap, F&T, 2"				2,546		2,546		2,546				2,546		2,546		2,546				2,546		2,546		2,546	
Repair Steam Trap, F&T, 1"		1,697	1,697	2,546	1,697	4,242	1,697	4,242		1,697	1,697	2,546	1,697	4,242	1,697	4,242		1,697	1,697	2,546	1,697	4,242	1,697	4,242	
Maintain Steam Trap, F&T, 2"	264		264	264	264	264	264	264	264		264	264	264	264	264	264	264		264	264	264	264	264	264	264
Repack Gland, Gate Valve, 6"				63												63									
Replace Radiator, Finned, Wall								227																	
Maintain Exhaust Fan, Propeller, 1,000 Cfm	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123	123
Re-tape Pipe Insulation, Fiberglass, Heating Water/Steam		141	510				141	510					227				141	510				141	283		
Replace Pipe & Fittings, 10" Steel (20% of Pipe)												2,130													
Inspect, Clean, & Verify Opening/Closing, Check Valve, 8"	58	58	58	58	58	58	58	58	58	58	58	58	58	58		58	58	58	58	58	58	58	58	58	58
Replace Pipe & Fittings, 12" Steel (20% of Pipe)												6,331													
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of Ins													478										956		
Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20												644	1,286										1,029		
Repair Heat Exchanger, Plate/frame	2,372					2,372					2,372					2,372								2,372	
Re-tape Pipe Insulation, Fiberglass, Chilled Water			424					424					283					424					141		
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel																									
Replace 10' Section, Pipe & Fittings, 12" Steel									316															316	
Replace Pipe & Fittings, 10" Steel (20% of Pipe)												2,555													
Install New Gasket & Bolts, Pipe & Fittings, 10" Steel																									
Replace 10' Section, Pipe & Fittings, 10" Steel									127															127	

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Maintain Unit Heater, 36 Mbh	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	323	1,292	969	1,292	1,292	1,292	1,292	1,292	1,292
Install New Gasket & Bolts, Pipe & Fittings, 18" Steel												57													
Replace Flow Control Valve, Motorized, 8"							7,302																		
Replace Valve Actuator, 8"			5,044																						
Maintain Flow Control Valve & Actuator, 8"	108	108	108	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Flow Control Valve, Motorized, 6"																									
Replace Valve Actuator, 6"																									
Maintain Flow Control Valve & Actuator, 6"	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324
Replace Circulation Pump, 50 HP, Chiller & Condenser Water																			38,311						
Repair Circulation Pump, 50 HP, Chiller & Condenser Water			471																						
Maintain Circulation Pump, 50 HP, Chiller & Condenser Water	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123
Replace Check Valve, 8"																									
Maintain Heat Exchanger, Plate/frame	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105		105	105	105	105	105	105	105	105
Replace Pipe & Fittings, 18" Steel (20% of Pipe)																									
Maintain Steam Trap, F&T, 1"	352	616	440	616	616	616	616	440	352	616	440	616	616	616	616	440	352	616	440	616	616	616	616	440	352
Replace 10' Section, Pipe & Fittings, 18" Steel											703												703		
Replace Steam Trap, F&T, 2"	5,843								5,843								5,843								5,843
Replace Steam Trap, F&T, 1"	2,216		1,477					1,477	2,216		1,477					1,477	2,216		1,477					1,477	2,216
Repair Steam Trap, F&T, 2"			2,546		2,546		2,546				2,546		2,546		2,546				2,546		2,546		2,546		
Repair Steam Trap, F&T, 1"	1,697	1,697	2,546	1,697	4,242	1,697	4,242		1,697	1,697	2,546	1,697	4,242	1,697	4,242		1,697	1,697	2,546	1,697	4,242	1,697	4,242		1,697
Maintain Steam Trap, F&T, 2"		264	264	264	264	264	264	264		264	264	264	264	264	264	264		264	264	264	264	264	264	264	
Repack Gland, Gate Valve, 6"						63															63				
Replace Radiator, Finned, Wall			227																				227		
Maintain Exhaust Fan, Propeller, 1,000 Cfm		123	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123
Re-tape Pipe Insulation, Fiberglass, Heating Water/Steam		141	510				141	510					227				141	510				141	283		
Replace Pipe & Fittings, 10" Steel (20% of Pipe)																									
Inspect, Clean, & Verify Opening/Closing, Check Valve, 8"	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Replace Pipe & Fittings, 12" Steel (20% of Pipe)																									
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of In													478										956		
Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20												644	1,286										1,029		
Repair Heat Exchanger, Plate/frame				2,372					2,372					2,372								2,372			
Re-tape Pipe Insulation, Fiberglass, Chilled Water			424					424					283					424					141		
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel												66													
Replace 10' Section, Pipe & Fittings, 12" Steel											316												316		
Replace Pipe & Fittings, 10" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 10" Steel												39													
Replace 10' Section, Pipe & Fittings, 10" Steel											127												127		

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Pipe & Fittings, 8" Steel (20% of Pipe)												1,615													
Install New Gasket & Bolts, Pipe & Fittings, 8" Steel																									
Replace 10' Section, Pipe & Fittings, 8" Steel									81															81	
Replace Pipe & Fittings, 6" Steel (20% of Pipe)												1,921													
Replace Pipe & Fittings, 3" Copper (20% of Pipe)												3,173													
Replace Heat Exchanger, Plate/frame																		119,222							
Resolder Joint, Pipe & Fittings, 3" Copper							77															77			
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel																									
Replace 10' Section, Pipe & Fittings, 3" Copper																									
Replace 10' Section, Pipe & Fittings, 2" Steel								141												141					
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel																									
Replace Pipe & Fittings, 2" Steel (20% of Pipe)																							2,824		
Replace 10' Section, Pipe & Fittings, 4" Steel					102												102								
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel						49																			
Replace 10' Section, Pipe & Fittings, 6" Steel									95															95	
D40 Fire Protection																									
Replace Fire Extinguisher										3,190												3,190			
Inspect & Test Fire Extinguisher			348					348							348					348					
D50 Electrical																									
Replace Fluorescent Lighting Fixture, T8, 2-32 w			2,911					5,822										1,164					2,911		
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 4-																		1,885							
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-3								743					1,858					3,715							
Replace Fluorescent Lighting Fixture, T12, 4-60 w								3,105																	
Replace Ballast & Lamp, HP Sodium Lighting Fixture, 250 w																		5,462							
Replace Exit Lighting Fixture, w/ Battery																	1,146	1,527							
Replace Lamp, Metal Halide Lighting Fixture, Low Bay, 250 w			153										153					153					153		
Replace Transfer Switch, Auto, 600 V, 600 Amp.		15,118																		15,118					
Replace Ballast, Metal Halide Lighting Fixture, Low Bay, 250 w																		264							
Replace HP Sodium Lighting Fixture, 250 w								15,246																	
Maintain Secondary Transformer, Dry, 300 kVA	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Lamp, Exit Lighting Fixture, w/ Battery		239	318				239	318				239	318									239	318		
Replace Emergency Lighting Pack, 2 Light w/ Battery			3,440					11,467															3,440		
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/ B	238	793		793	238	793	238		238	793	238	793	238	793	238	793	238	793	238	793	238	793		793	238
Repair Transfer Switch, Auto, 600 V, 600 Amp.							273					273					273								273
Inspect & Clean Transfer Switch, Auto, 600 V, 600 Amp.	30		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30
Replace Secondary Transformer, Dry, 300 kVA			23,656																						

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Pipe & Fittings, 8" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 8" Steel												32													
Replace 10' Section, Pipe & Fittings, 8" Steel											81												81		
Replace Pipe & Fittings, 6" Steel (20% of Pipe)																									
Replace Pipe & Fittings, 3" Copper (20% of Pipe)												3,173													
Replace Heat Exchanger, Plate/frame																119,222									
Resolder Joint, Pipe & Fittings, 3" Copper							77															77			
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel												49													
Replace 10' Section, Pipe & Fittings, 3" Copper							159																		
Replace 10' Section, Pipe & Fittings, 2" Steel										141												141			
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel																							84		
Replace Pipe & Fittings, 2" Steel (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 4" Steel				102												102									
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel						49																			
Replace 10' Section, Pipe & Fittings, 6" Steel											95												95		
D40 Fire Protection																									
Replace Fire Extinguisher									3,190												3,190				
Inspect & Test Fire Extinguisher		348					348							348					348						
D50 Electrical																									
Replace Fluorescent Lighting Fixture, T8, 2-32 w			5,822										1,164					2,911					5,822		
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 4													1,885												
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-			743					1,858					3,715										743		
Replace Fluorescent Lighting Fixture, T12, 4-60 w			3,105																				3,105		
Replace Ballast & Lamp, HP Sodium Lighting Fixture, 250 w													5,462												
Replace Exit Lighting Fixture, w/ Battery												1,146	1,527												
Replace Lamp, Metal Halide Lighting Fixture, Low Bay, 250 w								153					153					153							
Replace Transfer Switch, Auto, 600 V, 600 Amp.													15,118												
Replace Ballast, Metal Halide Lighting Fixture, Low Bay, 250													264												
Replace HP Sodium Lighting Fixture, 250 w			15,246																				15,246		
Maintain Secondary Transformer, Dry, 300 kVA	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Lamp, Exit Lighting Fixture, w/ Battery		239	318				239	318									239	318				239	318		
Replace Emergency Lighting Pack, 2 Light w/ Battery			11,467															3,440					11,467		
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/	793	238		238	793	238	793	238	793	238	793	238	793	238	793	238	793		793	238	793	238		238	793
Repair Transfer Switch, Auto, 600 V, 600 Amp.					273					273								273					273		
Inspect & Clean Transfer Switch, Auto, 600 V, 600 Amp.	30	30	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30	30	30	30	30	30	30	30
Replace Secondary Transformer, Dry, 300 kVA								23,656																	

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Metal Halide Lighting Fixture, Low Bay, 250 w								671																	
Repair Secondary Transformer, Dry, 300 kVA													577										577		
Repair Smoke Detector																		1,200							
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/ Ba													126					421							
Maintain Public Address Speaker	120	120		120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	120	120	120
Replace Secondary Transformer, Dry, 225 kVA			31,600																						
Replace Disconnect Switch, 60 Amp.																		870							
Replace Generator, Diesel, 175 kw															151,379										
Electrical Testing, Generator, Diesel, 175 kw	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088		1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088
Replace Electric Motor, 75 HP												15,816													
Maintain Electric Motor, 75 HP	72	72	72	72	72	72	72	72	72	72	72		72	72	72	72	72	72	72	72	72	72	72	72	72
Inspect and Test Meter, Electrical, 208 Volt, 400 Amp.	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30		30	30
Replace Meter, Electrical, 208 Volt, 400 Amp.																							441		
Replace Public Address Speaker			1,340															1,340							
Replace Batteries & Check Operation, Smoke Detector	472	472	472	472	472	472	472		472	472	472	472	472	472	472	472	472	472	472	472	472	472		472	472
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150			348					348					348										348		
Replace Manual Pull Station								758															758		
Check & Repair Manual Pull Station																		321							
Replace Fire Alarm Horn & Strobe																		1,065							
Replace Fire Alarm Bell, 6"																		221							
Replace Receptacle, 208 V, 3 phase													1,428												
Replace Receptacle, 120 V, 20 Amp.													2,098				1,050								
Replace Receptacle, 120 V, 15 Amp.			1,080														5,402	2,161					1,080		
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w																		1,712							
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 150								685																	
Replace Smoke Detector								3,523															3,523		
Maintain Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217		217	217
Maintain Motor Control Center w/ Main Breaker, 480 V, 600 Am	543	543	543	543	543	543	543	543	543	543	543	543		543	543	543	543	543	543	543	543	543	543	543	543
Replace Distribution Panel Board								11,525																	
Maintain Distribution Panel Board	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Disconnect Switch, 200 Amp.																		1,540							
Maintain Disconnect Switch, 200 Amp.	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84		84	84	84	84	84	84	84
Repair Disconnect Switch, 60 Amp.								380										190							
Maintain Disconnect Switch, 60 Amp.	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	30	60	60	60	60	60	60	60
Replace Disconnect Switch, 30 Amp.								1,751										1,751							
Repair Motor Control Center w/ Main Breaker, 480 V, 600 Amp.			4,199																				4,199		
Replace Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.																							25,707		

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Metal Halide Lighting Fixture, Low Bay, 250 w			671																				671		
Repair Secondary Transformer, Dry, 300 kVA																		577							
Repair Smoke Detector								1,200															1,200		
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/								126					421												
Maintain Public Address Speaker	120	120	120	120	120	120	120		120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120
Replace Secondary Transformer, Dry, 225 kVA								31,600																	
Replace Disconnect Switch, 60 Amp.			870																						
Replace Generator, Diesel, 175 kw															151,379										
Electrical Testing, Generator, Diesel, 175 kw	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088		1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088
Replace Electric Motor, 75 HP												15,816													
Maintain Electric Motor, 75 HP	72	72	72	72	72	72	72	72	72	72	72		72	72	72	72	72	72	72	72	72	72	72	72	72
Inspect and Test Meter, Electrical, 208 Volt, 400 Amp.	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Replace Meter, Electrical, 208 Volt, 400 Amp.																									
Replace Public Address Speaker								1,340															1,340		
Replace Batteries & Check Operation, Smoke Detector	472	472	472	472	472	472	472	472	472	472	472	472		472	472	472	472	472	472	472	472	472	472	472	472
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150			348					348										348					348		
Replace Manual Pull Station													758												
Check & Repair Manual Pull Station								321															321		
Replace Fire Alarm Horn & Strobe													1,065												
Replace Fire Alarm Bell, 6"													221												
Replace Receptacle, 208 V, 3 phase								1,428																	
Replace Receptacle, 120 V, 20 Amp.								2,098				1,050													
Replace Receptacle, 120 V, 15 Amp.												5,402	2,161					1,080							
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w													1,712												
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 15			685																				685		
Replace Smoke Detector													3,523												
Maintain Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217
Maintain Motor Control Center w/ Main Breaker, 480 V, 600 A	543	543	543	543	543	543	543		543	543	543	543	543	543	543	543	543	543	543	543	543	543	543	543	543
Replace Distribution Panel Board													11,525												
Maintain Distribution Panel Board	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91
Replace Disconnect Switch, 200 Amp.																									
Maintain Disconnect Switch, 200 Amp.	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Repair Disconnect Switch, 60 Amp.			190										380										380		
Maintain Disconnect Switch, 60 Amp.	60	60	30	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Replace Disconnect Switch, 30 Amp.																		1,751							
Repair Motor Control Center w/ Main Breaker, 480 V, 600 Am																		4,199							
Replace Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.																									

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Maintain Disconnect Switch, 30 Amp.	360	360	360	360	360	360	360	240	360	360	360	360	360	360	360	360	360	240	360	360	360	360	360	360	360
Replace Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.																							15,824		
Repair Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.			5,027										5,027												
Maintain Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363		363	363
Replace Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.																							5,004		
Repair Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.			2,011										2,011												
Maintain Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145		145	145
Repair Secondary Transformer, Dry, 225 kVA													927										927		
Repair Disconnect Switch, 200 Amp.								220																	
Repair Disconnect Switch, 30 Amp.			746					746					746					746					746		
Replace Power Panel Board, 208 Y/120 V, 225 Amp.								27,662																	
Maintain Secondary Transformer, Dry, 225 kVA	181	181		181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
Repair Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.			3,016										3,016												
Replace Motor Control Center w/ Main Breaker, 480 V, 600 Am													85,654												
Repair Power Panel Board, 480 V, 400 Amp.																		180							
Maintain Power Panel Board, 480 V, 400 Amp.	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Power Panel Board, 208 Y/120 V, 400 Amp.																									
Maintain Power Panel Board, 208 Y/120 V, 400 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
Replace Power Panel Board, 480 V, 400 Amp.								10,178																	
Repair Power Panel Board, 208 Y/120 V, 225 Amp.																		570							
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	363	363	363	363	363	363	363		363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363
Inspect & Clean Motor Starter, 5-20 HP, <600 V	60		60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60		60	60	60	60	60
Inspect & Clean Motor Starter, <5HP, <600V	485	121	485	424	485	485	485	424	485	485	485	485	485	485	485	485	485	485	485	121	485	424	485	485	485
Replace Coil, Motor Starter, <5HP, <600V	264	264			1,842		264	1,579		264	1,842		264	1,842		264	1,842		264	264			1,842		264
Repair Power Panel Board, 208 Y/120 V, 400 Amp.							285										285								
Replace Motor Starter, <5HP, <600V		4,216		703				703												4,216		703			
Replace Coil, Motor Starter, 5-20 HP, <600 V					264			264			264			264			264						264		
Replace Motor Starter, 5-20 HP, <600 V		860																		860					
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	272	272	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272	272	272	272	272	272
Repair Power Panel Board, 208 Y/120 V, 200 Amp.	428																				428				
Replace Power Panel Board, 208 Y/120 V, 200 Amp.											19,593														
F10 Special Construction																									
Service 8x6 Drive Thrust Oil Cooler	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Entrance Oil Cooler	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Exit Oil Cooler	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Lube Oil Pump/Motor	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Motor MCE - M1	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Maintain Disconnect Switch, 30 Amp.	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	240	360	360	360	360	360	360	360
Replace Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.																									
Repair Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.								5,027										5,027							
Maintain Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363
Replace Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.																									
Repair Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.								2,011										2,011							
Maintain Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Repair Secondary Transformer, Dry, 225 kVA																		927							
Repair Disconnect Switch, 200 Amp.			220										220										220		
Repair Disconnect Switch, 30 Amp.			1,493					746					1,493										1,493		
Replace Power Panel Board, 208 Y/120 V, 225 Amp.													27,662												
Maintain Secondary Transformer, Dry, 225 kVA	181	181	181	181	181	181	181		181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
Repair Circuit Breaker, 600 V, 125-400 Amp., 3 Ph.								3,016										3,016							
Replace Motor Control Center w/ Main Breaker, 480 V, 600 A								85,654																	
Repair Power Panel Board, 480 V, 400 Amp.			180																				180		
Maintain Power Panel Board, 480 V, 400 Amp.	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91
Replace Power Panel Board, 208 Y/120 V, 400 Amp.		16,482																							
Maintain Power Panel Board, 208 Y/120 V, 400 Amp.	181		181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
Replace Power Panel Board, 480 V, 400 Amp.													10,178												
Repair Power Panel Board, 208 Y/120 V, 225 Amp.			570																				570		
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	363	363	363	363	363	363	363	363	363	363	363	363		363	363	363	363	363	363	363	363	363	363	363	363
Inspect & Clean Motor Starter, 5-20 HP, <600 V	60	60	60	60	60	60	60	60	60	60	60	60		60	60	60	60	60	60	60	60	60	60	60	60
Inspect & Clean Motor Starter, <5HP, <600V	424	485	485	485	485	485	485	485	485	485	485	485	121	485	424	485	485	485	424	485	485	485	485	485	485
Replace Coil, Motor Starter, <5HP, <600V	1,579		264	1,842		264	1,842		264	1,842		264	264			1,842		264	1,579		264	1,842		264	1,842
Repair Power Panel Board, 208 Y/120 V, 400 Amp.												285										285			
Replace Motor Starter, <5HP, <600V	703												4,216		703				703						
Replace Coil, Motor Starter, 5-20 HP, <600 V	264			264			264			264						264			264			264			264
Replace Motor Starter, 5-20 HP, <600 V													860												
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272
Repair Power Panel Board, 208 Y/120 V, 200 Amp.						428																			
Replace Power Panel Board, 208 Y/120 V, 200 Amp.																19,593									

F10 Special Construction

Service 8x6 Drive Thrust Oil Cooler	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Entrance Oil Cooler	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Exit Oil Cooler	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Lube Oil Pump/Motor	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Motor MCE - M1	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Service 8x6 Drive Motor Temp Regulating Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Motors	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744
Service 8x6 Drive Speed Control Duplex Panels	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Service 8x6 Drive Speed Electrolyte Motor	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175
Service 8x6 Drive Sump Pump	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Drive Motor 2400V Switchgear	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175
Service 8x6 Return/Supply Valve Bldg 53	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service Drive Motor 1 Ring Comp Fan & Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service Drive Motor 2 Ring Comp Fan & Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service Drive Motor 3 Ring Comp Fan & Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Calibrate 8x6 Drive Axial Compressor			1,404			1,404			1,404			1,404			1,404			1,404			1,404			1,404	
Service 8x6 Drive Motor MCE - M2	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Electrolyte Cooler Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Perform Vibration Analysis of 8x6 Drive Compressor			1,404			1,404			1,404			1,404			1,404			1,404			1,404			1,404	
Inspection Lift Pump & Motor of Drive Compressor	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Electrolyte System	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042
Inspect 8x6 Drive Liquid Rheostat Pilot Motor	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
Service 8x6 Drive Compressor Thrust Bearing Oil Filters	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351
Service 8x6 Drive Motor MCE - M3	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Drive Electrolyte Pump System Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Compressor Norm/Emergency Lube Oil Pum	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
Inspect 8x6 Drive Downsteam Fan	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive DPU4-EQ770 WDPF Cabinet	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Motor Air Cooler	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Duplex Controls Panel	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532
Service 8x6 Drive Dynamic Braking MG System	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Electric Cooler Valve	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Service 8x6 Drive Electrolyte Y-Trainer Strainer	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Lift Pump Assembly	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Drive Axial Compressor	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425
Inspect 8x6 Drive Motor Blowers	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Drive CTW Strainer	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Electrolyte Pumps	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Lube Oil Filter	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Oil Purifier	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Thrust High Pressure Pump Motor	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Maintain 8x6 Turning Gear	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Service 8x6 Drive Motor Temp Regulating Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Motors	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744	50,744
Service 8x6 Drive Speed Control Duplex Panels	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Service 8x6 Drive Speed Electrolyte Motor	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175
Service 8x6 Drive Sump Pump	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Drive Motor 2400V Switchgear	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175
Service 8x6 Return/Supply Valve Bldg 53	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service Drive Motor 1 Ring Comp Fan & Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service Drive Motor 2 Ring Comp Fan & Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service Drive Motor 3 Ring Comp Fan & Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Calibrate 8x6 Drive Axial Compressor		1,404			1,404			1,404			1,404			1,404			1,404			1,404			1,404		
Service 8x6 Drive Motor MCE - M2	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Electrolyte Cooler Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Perform Vibration Analysis of 8x6 Drive Compressor		1,404			1,404			1,404			1,404			1,404			1,404			1,404			1,404		
Inspection Lift Pump & Motor of Drive Compressor	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Electrolyte System	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042	14,042
Inspect 8x6 Drive Liquid Rheostat Pilot Motor	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
Service 8x6 Drive Compessor Thrust Bearing Oil Filters	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351
Service 8x6 Drive Motor MCE - M3	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Drive Electrolyte Pump System Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Compressor Norm/Emergency Lube Oil Pu	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
Inspect 8x6 Drive Downsteam Fan	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive DPU4-EQ770 WDPF Cabinet	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Motor Air Cooler	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Duplex Controls Panel	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532
Service 8x6 Drive Dynamic Braking MG System	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Drive Electric Cooler Valve	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Service 8x6 Drive Electrolyte Y-Trainer Strainer	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Lift Pump Assembly	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Drive Axial Compressor	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425	8,425
Inspect 8x6 Drive Motor Blowers	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Drive CTW Strainer	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Drive Electrolyte Pumps	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Lube Oil Filter	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Oil Purifier	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Thrust High Pressure Pump Motor	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Maintain 8x6 Turning Gear	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617

Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Perform 8x6 Low Voltage Meggering Bldg 59	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Perform 8x6 Thermography Bldg 53	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698
Service 8x6 Drive Compressor Lube Oil Purifier Pump/Motor	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Service 8x6 Drive CTW System Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Dynamic Braking Switchgear	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349
Service 8x6 Drive Electrolyte Cooler	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Battery	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699

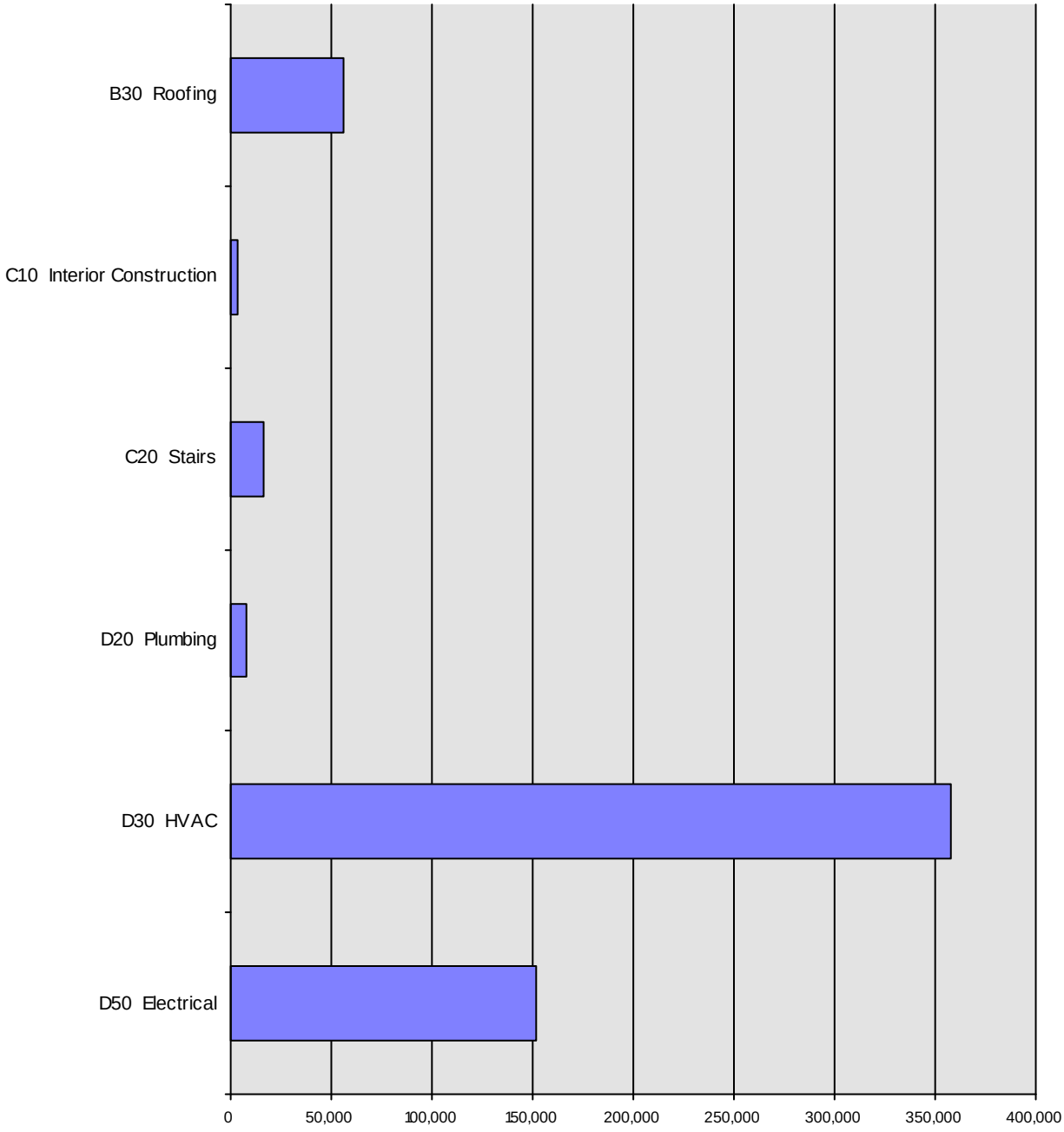
Building: SWT Drive Equipment Building **Facility:** Glenn Research Center

Building Num: 0053 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Perform 8x6 Low Voltage Meggering Bldg 59	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Perform 8x6 Thermography Bldg 53	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698
Service 8x6 Drive Compressor Lube Oil Purifier Pump/Motor	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Service 8x6 Drive CTW System Valves	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Drive Dynamic Braking Switchgear	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349
Service 8x6 Drive Electrolyte Cooler	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Drive Battery	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699	8,699

Building Deferred Maintenance by System Chart

Building: SWT Drive Equipment Building **Building Num:** 0053



All costs expressed in ($) 2012. Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral and is included in Total Deferred Maintenance.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: SWT Drive Equipment Buildi
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $29,901,628
per SF: $1,350

Building Type: Central Plant, Chilled Water
Building Gsft: 22,152
Building Number: 0053

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1985	8	Replace Motor Control Center w/ Main Breaker, 480 V, 600 Amp.	$85,654	$0	$85,654
1949	49	Replace Gate Valve, 20"	$79,467	$0	$79,467
1949	34	Replace Membrane, Built-up Roof	$56,213	$0	$56,213
1949	44	Replace Water Storage Tank, 750 Gal.	$42,729	$0	$42,729
1960	21	Replace Circulation Pump, 50 HP, Chiller & Condenser Water	$38,311	$0	$38,311
1960	27	Replace Oil Storage Tank, 550 Gal.	$19,867	$0	$19,867
1949	49	Replace Gate Valve, 14"	$16,924	$0	$16,924
1949	14	Replace Metal, Painted, Interior Railing	$16,655	$0	$16,655
1960	17	Replace Flow Control Valve, Motorized, 6"	$15,168	$0	$15,168
1960	35	Replace Transfer Switch, Auto, 600 V, 600 Amp.	$15,118	$0	$15,118
1960	38	Replace Gate Valve, 2-3"	$11,626	$0	$11,626
1980	13	Replace Emergency Lighting Pack, 2 Light w/ Battery	$11,467	$0	$11,467
1990	8	Replace Gate Valve, 6"	$10,738	$0	$10,738
1949	49	Replace Gate Valve, 10"	$10,679	$0	$10,679
1949	49	Replace Valve, Non-Drain, 16"	$10,318	$0	$10,318
1990	8	Replace Valve, Non-Drain, 16"	$10,318	$0	$10,318
1949	25	Replace Check Valve, 8"	$10,249	$0	$10,249
1949	49	Replace Gate Valve, 8"	$7,407	$0	$7,407
1949	52	Replace Condensate Receiver Station, 10-15 Gal.	$6,956	$0	$6,956
1960	28	Replace Pipe & Fittings, 2" Copper, Fuel Oil (20% of Pipe)	$6,281	$0	$6,281
1960	28	Replace Pipe & Fittings, 2" Copper (20% of Pipe)	$6,281	$0	$6,281
1990	15	Replace Steam Trap, F&T, 2"	$5,843	$0	$5,843
1980	13	Replace Fluorescent Lighting Fixture, T8, 2-32 w	$5,822	$0	$5,822
1949	44	Replace Receptacle, 120 V, 15 Amp.	$5,402	$0	$5,402
1980	13	Replace Steel Damper, Motorized, w/ Actuator	$5,279	$0	$5,279
1993	5	Replace Ball Valve, 4"	$4,309	$0	$4,309
1960	35	Replace Motor Starter, <5HP, <600V	$4,216	$0	$4,216
1949	39	Replace Pipe & Fittings, 2" Copper, Fuel Oil (20% of Pipe)	$3,997	$0	$3,997
1949	49	Replace HVAC Control Panel	$3,662	$0	$3,662
1990	8	Replace Smoke Detector	$3,523	$0	$3,523
1949	39	Replace Pipe & Fittings, 3" Copper (20% of Pipe)	$3,173	$0	$3,173
1980	13	Replace Fluorescent Lighting Fixture, T12, 4-60 w	$3,105	$0	$3,105
1960	13	Replace Wood, Solid Core w/ Safety Glass, Painted, Interior Door	$2,912	$0	$2,912

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: SWT Drive Equipment Buildi
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $29,901,628
per SF: $1,350

Building Type: Central Plant, Chilled Water
Building Gsft: 22,152
Building Number: 0053

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1960	38	Replace Gate Valve, 6"	$2,685	$0	$2,685
1949	24	Replace Floor Drain	$2,620	$0	$2,620
1960	21	Replace Unit Heater, 36 Mbh	$2,528	$0	$2,528
1980	18	Replace Gate Valve, 2-3"	$2,325	$0	$2,325
1990	15	Replace Steam Trap, F&T, 1"	$2,216	$0	$2,216
1970	23	Replace Receptacle, 120 V, 15 Amp.	$2,161	$0	$2,161
1985	8	Replace Receptacle, 120 V, 20 Amp.	$2,098	$0	$2,098
1980	18	Replace Exhaust Fan, Centrifugal, 2,000 Cfm	$2,041	$0	$2,041
1990	3	Replace Metal Halide Lighting Fixture, Wall Mount, 150 w	$1,712	$0	$1,712
1993	3	Replace Flow Control Valve, Motorized, 2"	$1,665	$0	$1,665
1960	43	Replace Thermostat	$1,615	$0	$1,615
1970	23	Replace Exit Lighting Fixture, w/ Battery	$1,527	$0	$1,527
1949	32	Replace Unit Heater, 12 Mbh	$1,522	$0	$1,522
1960	45	Replace Steam Trap, F&T, 1"	$1,477	$0	$1,477
1949	56	Replace Steam Trap, F&T, 1"	$1,477	$0	$1,477
1985	8	Replace Receptacle, 208 V, 3 phase	$1,428	$0	$1,428
1970	28	Replace Public Address Speaker	$1,340	$0	$1,340
1993	5	Replace Exhaust Fan, Propeller, 1,000 Cfm	$1,183	$0	$1,183
1949	38	Replace Ventilator, 12"	$1,170	$0	$1,170
1970	23	Replace Fluorescent Lighting Fixture, T8, 2-32 w	$1,164	$0	$1,164
1949	44	Replace Exit Lighting Fixture, w/ Battery	$1,146	$0	$1,146
1985	2	Replace Existing Ductwork (20% of Ductwork)	$1,126	$0	$1,126
1960	18	Replace Service Sink, Iron, Enamel	$1,089	$0	$1,089
1990	3	Replace Fire Alarm Horn & Strobe	$1,065	$0	$1,065
2000	3	Replace Drinking Fountain, Refrigerated	$1,064	$0	$1,064
1949	44	Replace Receptacle, 120 V, 20 Amp.	$1,050	$0	$1,050
1960	28	Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20% of	$1,029	$0	$1,029
1960	18	Replace Lavatory, Vitreous China	$1,004	$0	$1,004
1960	28	Replace Pipe Insulation, Fiberglass, Chilled Water (20% of Insulati	$956	$0	$956
1960	18	Replace Urinal, Vitreous China	$945	$0	$945
1960	33	Replace Toilet Partitions, Painted Metal, Overhead Braced	$882	$0	$882
1995	3	Replace Fan & Motor, Exhaust Fan, Ceiling 200-500 Cfm	$863	$0	$863
1960	35	Replace Motor Starter, 5-20 HP, <600 V	$860	$0	$860

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: SWT Drive Equipment Buildi
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $29,901,628
per SF: $1,350

Building Type: Central Plant, Chilled Water
Building Gsft: 22,152
Building Number: 0053

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1990	8	Replace Manual Pull Station	$758	$0	$758
1980	15	Replace Motor Starter, <5HP, <600V	$703	$0	$703
1949	39	Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20% of	$644	$0	$644
1949	49	Replace Gate Valve, 2-3"	$581	$0	$581
1993	5	Replace Gate Valve, 2-3"	$581	$0	$581
1990	6	Replace Gate Valve, 2-3"	$581	$0	$581
1960	33	Replace Radiator, Finned, Wall	$227	$0	$227
1970	23	Replace Fire Alarm Bell, 6"	$221	$0	$221
1949	39	Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insulation	$144	$0	$144
1949	39	Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insulation)	$48	$0	$48
		Total	**$593,192**	**$0**	**$593,192**

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Operations Task Details

Whitestone Research

Building: SWT Drive Equipment Building **Year Built:** 1949 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0053

City: Cleveland, OH **Replacement Value:** $29,901,628 **per SF:** $1,350 **Building Gsft:** 22,152

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Custodial		**Level of Service: Low**			
Mechanical/Equipment	18164	Sweep Hard Floor with 48" Push Broom	$375	$61	$436
Mechanical/Equipment	18164	Empty Trash; Wipe Clean & Re-line Basket	$240	$39	$279
Storage	3101	Sweep Hard Floor with 48" Push Broom	$64	$10	$74
Storage	3101	Empty Trash; Wipe Clean & Re-line Basket	$41	$7	$48
Computer Room	664	Damp Wipe Surfaces with Trigger Sprayer & Cloth	$112	$18	$131
Computer Room	664	Wet Mop & Rinse Hard Floor with 32 oz. Mop Using Double Bucket & Wringer	$88	$14	$102
Computer Room	664	Sweep Hard Floor with 36" Push Broom	$64	$10	$75
Computer Room	664	Empty Trash; Wipe Clean & Re-line Basket	$38	$6	$44
Restroom	221	Service Restroom: Empty Trash, Clean & Disinfect Fixtures, Wipe Mirrors, Replace Supplies, Wet	$532	$86	$618
Restroom	221	Service Restroom: Empty Trash, Replace Supplies & Touch Up as Needed	$82	$13	$95
Total:			**$1,636**	**$266**	**$1,901**
Operation: Grounds		**Level of Service: Medium**			
Grounds, Improved	13291	Mow Turfgrass with 21" Power Mower	$775	$322	$1,098
Grounds, Improved	13291	Aerate Improved Grounds	$707	$294	$1,001
Grounds, Improved	13291	Clear Shrubs	$472	$196	$668
Grounds, Improved	13291	Overseed, Improved Grounds	$353	$147	$500
Grounds, Improved	13291	Edge Clean & Trim Walks with Gas Powered Edger	$297	$124	$421
Grounds, Improved	13291	Vacuum with 30" Billy Goat	$236	$98	$334
Grounds, Improved	13291	Clear Crabgrass	$177	$73	$250
Grounds, Improved	13291	Clear Weeds with 15" Boom, Improved Grounds	$94	$39	$133
Grounds, Improved	13291	Fertilize Improved Grounds	$71	$29	$100
Grounds, Improved	13291	Trim Around Raised Objects with String Edger	$61	$25	$86
Grounds, Improved	13291	Sweep with 30" Power Rake	$47	$19	$66
Grounds, Improved	13291	Fertilize Using Power Take Off Broadcast	$0	$0	$0
Total:			**$3,289**	**$1,368**	**$4,657**
Operation: Pest Control		**Level of Service: Medium**			

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Pest Controlled	22152	Install, or Check and Re-Bait 5 Rodent Boxes	$603	$251	$853
Pest Controlled	22152	Perform Crawling Insect Abatement	$452	$188	$641
Pest Controlled	22152	Inspect Building for Pests	$252	$0	$252
Total:			**$1,307**	**$439**	**$1,746**
Operation: Road Clearance		**Level of Service: Medium**			
Pavement NASA	17721	Plow Paved Area	$1,363	$411	$1,774
Total:			**$1,363**	**$411**	**$1,774**
Operation: Security		**Level of Service: Medium**			
Secured Area	22152	Patrol Building Perimeter	$3,746	$609	$4,354
Secured Area	22152	Guard Lobby/Parking	$0	$0	$0
Total:			**$3,746**	**$609**	**$4,354**

Building Operations Service Details

Whitestone Research

Building: SWT Drive Equipment Building | **Year Built:** 1949 | **FTEs:** 23 | **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center | **Original Cost:** $1 | **Building Num:** 0053

City: Cleveland, OH | **Replacement Value:** $29,901,628 | **per SF:** $1,350 | **Building Gsft:** 22,152

	Service*	Quantity	Rate	Cost
Operation: Security	**Level of Service: Medium**			
	Intrusion Detection Systems	1	$4,986	$4,986
	System Monitoring	1	$3,615	$3,615
	Access Control	1	$2,690	$2,690
	Total:			**$11,291**
Operation: Telecom	**Level of Service: High**			
	Local Telephone	23	$468	$10,764
	Data	23	$3,588	$5,529
	Long Distance Telephone	23	$192	$4,416
	Total:			**$20,709**

All costs expressed in ($) 2012.

19-Dec-14

* Secutity may be composed of service and task based cost. See Building Operations Task Details for Security Tasks.

Building Operations Management Details

Whitestone Research

Building: SWT Drive Equipment Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $29,901,628 **per SF:** $1,350

Building Type: Central Plant, Chilled Wate
Building Num: 0053
Building Gsft: 22,152

	Service	Demand	UM	PRV	Cost
Operation: Management	**Level of Service: Low**				
	Management	0.3%	PRV	$29,901,628	$74,754
	Total:				**$74,754**

All costs expressed in ($) 2012.

Average M&R Costs

Whitestone Research

Building: Research & Control Building
Building Number: 0054
Facility: Glenn Research Center
City: Cleveland, OH

GSFT: 2,900
PRV: $16,363,138
Built Date: 1949

M&R Average Annual Cost Forecasts

	Current Year	5 Year	20 Year	50 Year
PM & Minor Repair:	$5,647	$5,360	$5,368	$5,301
Unscheduled Maintenance:	$4,000	$3,858	$3,840	$3,797
Renewal & Replacement:	$2,546	$7,467	$23,901	$25,057
Total M&R Costs:	$12,193	$16,685	$33,109	$34,155
Per GSFT:	$4.20	$5.75	$11.42	$11.78
As % of PRV:	0.07%	0.10%	0.20%	0.21%

All costs expressed in ($) 2012.
Based on a 50-Year Forecast.

Building Component List

Whitestone Research

Building: Research & Control Building **Year Built:** 1949 **Building Type:** Data Center

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0054

City: Cleveland, OH **Replacement Value:** $16,363,138 **per SF:** $5,642 **Building Gsft:** 2,900

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
B2020		Aluminum Operable Window, 12 sf, 1st Floor	1949	2 Each		
B2030		Steel, Painted, Exterior Door	1990	1 Each		
B3010		Built-up Roof	1980	2350 Sq Ft		
C1020		Steel, Painted, Interior Door	1990	3 Each		
C1020		Steel, Painted, Interior Door	2000	3 Each		
C1020		Steel, Painted, Interior Double Door w/ Safety Glass	1990	1 Each		
C1020		Steel, Painted, w/ Safety Glass, Interior Door	2012	1 Each		
C3010		Acoustical Interior Wall Panels, Fabric Faced	1949	370 Sq Ft		
C3010		Clay Brick, Painted, Interior Wall Finish	1949	165 Sq Ft		
C3010		Fabric, Interior Wall Finish	2000	1155 Sq Ft		
C3010		Gypsum Board, Interior Wall Finish	1980	840 Sq Ft		
C3010		Gypsum Board, Interior Wall Finish	2012	645 Sq Ft		
C3010		Steel, Painted, Interior Wall Finish	1990	200 Sq Ft		
C3020		Access Flooring w/ Carpet, Raised	2000	1630 Sq Ft		
C3020		Access Flooring w/ Laminate, Raised	2000	229 Sq Ft		
C3020		Carpet, Nylon 20 oz., High Traffic	2012	389 Sq Ft		
C3020		Rubber Tile Flooring	2000	92 Sq Ft		
C3020		Vinyl Tile Flooring	1995	560 Sq Ft		
C3030		Acoustical Tile, Dropped Ceiling	2000	1750 Sq Ft		
C3030		Acoustical Tile, Dropped Ceiling	2012	389 Sq Ft		
C3030		Acoustical Tile, Dropped Ceiling	1990	761 Sq Ft		
D3030		Pipe & Fittings, 1" Copper	2006	0.25 K Ln Ft		
D3030		Pipe Insulation, Fiberglass, Chilled Water	2006	0.2 K Ln Ft		
D3040		Duct Insulation, Fiberglass Blanket	2010	225 Sq Ft		
D3040		Ductwork	2010	350 Lbs		
D3050		Air Conditioner, Computer Room, Chilled Water, 2 Ton	2010	4 Each		
D3060		Direct Digital Controls, System Points	2010	35 Each		
D3060		Thermostat	2006	4 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D4030		Fire Extinguisher	2006	1 Each		
D5010		Disconnect Switch, 30 Amp.	1980	1 Each		
D5010	P0106	Power Panel Board, 208 Y/120 V, 100 Amp.	1980	1 Each		
D5010	P0204	Power Panel Board, 208 Y/120 V, 100 Amp.	1970	1 Each		
D5010	P0118B	Power Panel Board, 208 Y/120 V, 225 Amp	1980	1 Each		
D5010	P0203B	Power Panel Board, 208 Y/120 V, 225 Amp	2006	1 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1995	4 Each		
D5020		Exit Lighting Fixture, w/ Battery	1995	4 Each		
D5020		Fluorescent Lighting Fixture, T12, 2-40 w	1995	59 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2006	6 Each		
D5020		Receptacle, 120 V, 15 Amp.	1990	28 Each		
D5020		Receptacle, 120 V, 15 Amp.	2006	12 Each		
D5020		Receptacle, 120 V, 20 Amp.	2006	4 Each		
D5020		Wiring Device, Switch	1980	11 Each		
D5020		Wiring Device, Switch	2006	5 Each		
D5030		Card Reader w/ Keypad	2006	7 Each		
D5030		Electric Lock	2006	7 Each		
D5030		Fire Alarm Horn & Strobe	1995	3 Each		
D5030		Intrusion Detection Motion Detector, Interior	2006	1 Each		
D5030		Manual Pull Station	1995	2 Each		
D5030		Manual Pull Station	1995	2 Each		
D5030		Monitor, Large, Closed Circuit	2012	10 Each		
D5030		Monitor, Small, Closed Circuit	2012	30 Each		
D5030		Public Address Speaker	1995	7 Each		
D5030		Smoke Detector	1990	10 Each		

Building Extended Component List with Remaining Service Life

Whitestone Research 04-Jun-15

Building: Research & Control Building **Year Built:** 1949 **Building Type:** Data Center

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0054

City: Cleveland, OH **Replacement Value:** $16,363,138 **per SF:** $5,642 **Building Gsft:** 2,900

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
B2020		Aluminum Operable Window, 12 sf, 1st Floor	1949	10	2 Each					
B2030		Steel, Painted, Exterior Door	1990	51	1 Each					
B3010		Built-up Roof	1980	-4	2350 Sq Ft	$26,159	$0	$26,159		
C1020		Steel, Painted, Interior Door	1990	51	3 Each					
C1020		Steel, Painted, Interior Door	2000	61	3 Each					
C1020		Steel, Painted, Interior Double Door w/ Safety	1990	51	1 Each					
C1020		Steel, Painted, w/ Safety Glass, Interior Door	2012	73	1 Each					
C3010		Acoustical Interior Wall Panels, Fabric Faced	1949	-30	370 Sq Ft	$5,294	$0	$5,294		
C3010		Clay Brick, Painted, Interior Wall Finish	1949	10	165 Sq Ft					
C3010		Fabric, Interior Wall Finish	2000	16	1155 Sq Ft					
C3010		Gypsum Board, Interior Wall Finish	1980	41	840 Sq Ft					
C3010		Gypsum Board, Interior Wall Finish	2012	73	645 Sq Ft					
C3010		Steel, Painted, Interior Wall Finish	1990	51	200 Sq Ft					
C3020		Access Flooring w/ Carpet, Raised	2000	11	1630 Sq Ft					
C3020		Access Flooring w/ Laminate, Raised	2000	11	229 Sq Ft					
C3020		Carpet, Nylon 20 oz., High Traffic	2012	6	389 Sq Ft					
C3020		Rubber Tile Flooring	2000	4	92 Sq Ft					
C3020		Vinyl Tile Flooring	1995	-1	560 Sq Ft					
C3030		Acoustical Tile, Dropped Ceiling	2000	21	1750 Sq Ft					
C3030		Acoustical Tile, Dropped Ceiling	2012	33	389 Sq Ft					
C3030		Acoustical Tile, Dropped Ceiling	1990	11	761 Sq Ft					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3030		Pipe & Fittings, 1" Copper	2006	17	0.25 K Ln Ft					
D3030		Pipe Insulation, Fiberglass, Chilled Water	2006	17	0.2 K Ln Ft					
D3040		Duct Insulation, Fiberglass Blanket	2010	22	225 Sq Ft					
D3040		Ductwork	2010	22	350 Lbs					
D3050		Air Conditioner, Computer Room, Chilled Wate	2010	35	4 Each					
D3060		Direct Digital Controls, System Points	2010	6	35 Each					
D3060		Thermostat	2006	2	4 Each					
D4030		Fire Extinguisher	2006	4	1 Each					
D5010		Disconnect Switch, 30 Amp.	1980	16	1 Each					
D5010	P0204	Power Panel Board, 208 Y/120 V, 100 Amp.	1970	-14	1 Each	$4,582	$0	$4,582		
D5010	P0106	Power Panel Board, 208 Y/120 V, 100 Amp.	1980	-4	1 Each	$4,582	$0	$4,582		
D5010	P0203B	Power Panel Board, 208 Y/120 V, 225 Amp	2006	22	1 Each					
D5010	P0118B	Power Panel Board, 208 Y/120 V, 225 Amp	1980	-4	1 Each	$6,915	$0	$6,915		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1995	1	4 Each					
D5020		Exit Lighting Fixture, w/ Battery	1995	1	4 Each					
D5020		Fluorescent Lighting Fixture, T12, 2-40 w	1995	1	59 Each					
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2006	12	6 Each					
D5020		Receptacle, 120 V, 15 Amp.	2006	12	12 Each					
D5020		Receptacle, 120 V, 15 Amp.	1990	-4	28 Each	$1,513	$0	$1,513		
D5020		Receptacle, 120 V, 20 Amp.	2006	12	4 Each					
D5020		Wiring Device, Switch	1980	-19	11 Each	$499	$0	$499		
D5020		Wiring Device, Switch	2006	7	5 Each					
D5030		Card Reader w/ Keypad	2006	2	7 Each					
D5030		Electric Lock	2006	2	7 Each					
D5030		Fire Alarm Horn & Strobe	1995	1	3 Each					
D5030		Intrusion Detection Motion Detector, Interior	2006	2	1 Each					
D5030		Manual Pull Station	1995	-4	2 Each	$303	$0	$303		
D5030		Manual Pull Station	1995	-4	2 Each	$303	$0	$303		

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5030		Monitor, Large, Closed Circuit	2012	8	10 Each					
D5030		Monitor, Small, Closed Circuit	2012	8	30 Each					
D5030		Public Address Speaker	1995	-4	7 Each	$2,347	$0	$2,347		
D5030		Smoke Detector	1990	-9	10 Each	$1,761	$0	$1,761		

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Forecast Year: 2013

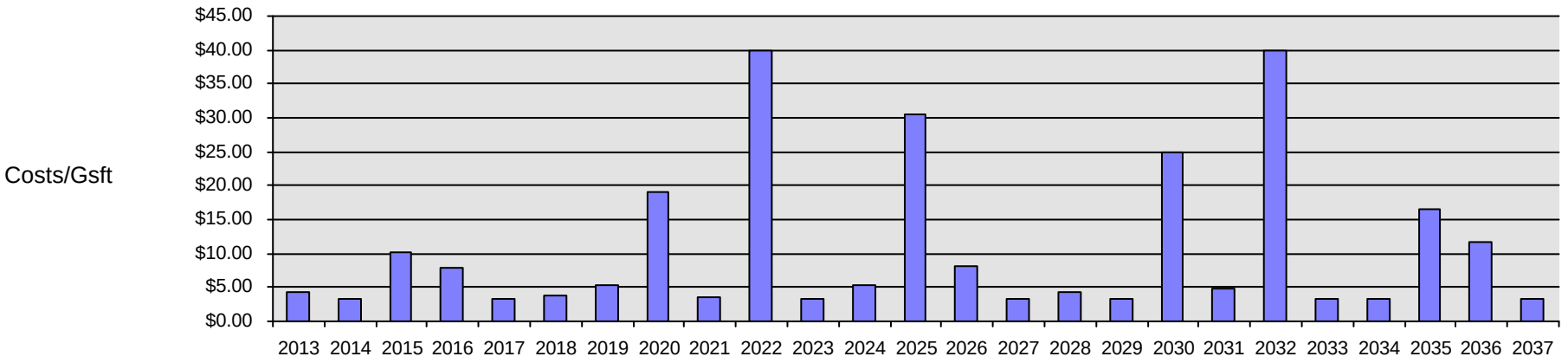
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Research & Control Building **Facility:** Glenn Research Center **City:** Cleveland, OH

2900

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
A10 Foundations																									
A20 Basement Construction																									
B10 Super Structure																									
B20 Exterior Enclosure			0.02					0.22				0.58	0.02					0.15					0.09		
B30 Roofing	0.07	0.07	0.12	0.07	0.07	0.07	0.07	0.12	0.07	0.07	0.07	0.07	4.39	0.07	0.07	0.07	0.07	0.12	0.07	0.07	0.07	0.07	0.12	0.07	0.07
C10 Interior Construction		0.07	0.16	0.04	0.02	0.07		1.01		0.21		0.04	0.16	0.07	0.02	0.04		1.04		0.18		0.07	0.16	0.04	0.02
C20 Stairs																									
C30 Interior Finishes	0.88	0.02	0.41	0.02	0.02	0.34	1.90	5.71	0.01	0.31		1.64	19.17	0.02	0.04	1.04		1.18	0.88	0.31		0.11	6.15	1.31	
D10 Conveying																									
D20 Plumbing																									
D30 HVAC	2.14	2.14	2.14	2.69	2.14	2.14	2.14	9.92	2.16	2.14	2.14	2.14	2.14	2.72	2.14	2.14	2.14	18.81	2.70	2.14	2.14	2.14	2.14	3.01	2.14
D40 Fire Protection				0.02		0.11					0.02					0.02		0.11					0.02		
D50 Electrical	1.12	0.96	7.29	4.94	1.12	0.96	1.12	1.96	1.20	37.17	1.12	0.96	4.74	5.37	1.12	0.96	1.12	3.56	1.20	37.17	1.12	0.96	7.96	7.21	1.12
E10 Equipment																									
E20 Furnishings																									
F10 Special Construction																									
F20 Selective Bldg Demolition																									
G10 Site Preparation																									
G20 Site Improvements																									
G30 Site Mechanical Utilities																									
G40 Site Electrical Utilities																									
G90 Other Site Construction																									
Total	**4.20**	**3.27**	**10.15**	**7.78**	**3.37**	**3.69**	**5.22**	**18.95**	**3.43**	**39.90**	**3.34**	**5.44**	**30.63**	**8.25**	**3.39**	**4.27**	**3.33**	**24.98**	**4.85**	**39.88**	**3.33**	**3.36**	**16.65**	**11.65**	**3.35**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 1-25

Based on a 50-Year Forecast.

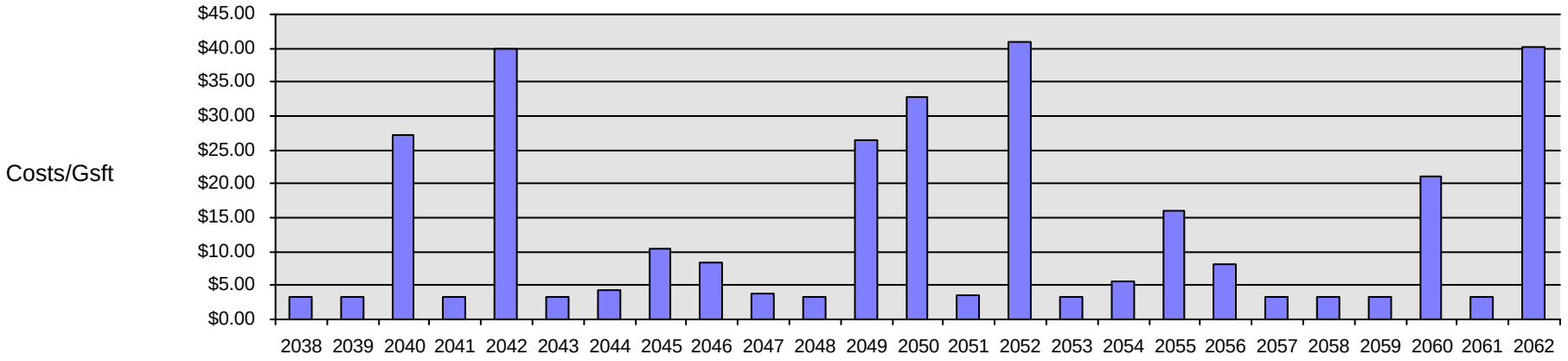
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Research & Control Building **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0054 **GSFT:** 2900

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2	**Total**
A10 Foundations																										**0.00**
A20 Basement Construction																										**0.00**
B10 Super Structure																										**0.00**
B20 Exterior Enclosure		0.02	0.15					0.02					0.22				0.02	0.02					0.15			**1.69**
B30 Roofing	0.07	0.07	9.02	0.07	0.07	0.07	0.07	0.12	0.07	0.07	0.07	0.07	0.12	0.07	0.07	0.07	0.07	4.39	0.07	0.07	0.07	0.07	0.12	0.07	0.07	**21.36**
C10 Interior Construction	0.07		1.01		0.21		0.04	0.16	0.07	0.02	0.04		1.04		0.18		0.07	0.16	0.04	0.02	0.07		1.01		0.21	**7.92**
C20 Stairs																										**0.00**
C30 Interior Finishes	0.02	0.01	0.93		0.30	0.10	1.15	4.19	0.02	0.44	0.02	1.30	18.80		1.35	0.04	2.20	1.16	0.03		0.03		6.87		0.34	**80.77**
D10 Conveying																										**0.00**
D20 Plumbing																										**0.00**
D30 HVAC	2.14	2.14	9.92	2.21	2.14	2.14	2.14	2.14	2.65	2.14	2.14	23.84	9.92	2.23	2.14	2.14	2.14	2.14	3.19	2.14	2.14	2.14	9.92	2.16	2.50	**181.29**
D40 Fire Protection			0.02		0.11					0.02					0.02		0.11					0.02				**0.56**
D50 Electrical	0.96	1.12	6.10	1.12	37.17	1.12	0.96	3.90	5.45	1.12	0.96	1.12	2.57	1.20	37.17	1.12	0.96	8.26	4.86	1.12	0.96	1.12	2.97	1.20	37.17	**295.31**
E10 Equipment																										**0.00**
E20 Furnishings																										**0.00**
F10 Special Construction																										**0.00**
F20 Selective Bldg Demolition																										**0.00**
G10 Site Preparation																										**0.00**
G20 Site Improvements																										**0.00**
G30 Site Mechanical Utilities																										**0.00**
G40 Site Electrical Utilities																										**0.00**
G90 Other Site Construction																										**0.00**
Total	**3.27**	**3.36**	**27.15**	**3.39**	**40.00**	**3.42**	**4.36**	**10.54**	**8.26**	**3.80**	**3.24**	**26.32**	**32.69**	**3.50**	**40.93**	**3.37**	**5.58**	**16.13**	**8.19**	**3.35**	**3.28**	**3.34**	**21.06**	**3.43**	**40.29**	**588.89**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 26-50

Based on a 50-Year Forecast.

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
B20 Exterior Enclosure																									
Replace Aluminum Operable Window, 12 sf, 1st Floor												1,693													
Maintain Steel, Painted, Exterior Door Locks			23					23					23					23					23		
Replace Steel, Painted, Exterior Door Locks								349										349							
Refinish Steel, Painted, Exterior Door								31										31							
Repair Steel, Painted, Exterior Door								204															204		
Repair Aluminum Operable Window, 12 sf, 1st Floor																									
B30 Roofing																									
Maintain Built-up Roof	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Non-Destructive Moisture Inspection, Built-up Roof			162					162					162					162					162		
Place New Membrane Over Existing, Built-up Roof												12,374													
Replace Membrane, Built-up Roof																									
C10 Interior Construction																									
Refinish Steel, Painted, w/ Safety Glass Interior Door				31				31				31				31				31				31	
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks					23					23					23					23					23
Replace Steel, Painted, Interior Double Door w/ Safety Glass L								334										334							
Maintain Steel, Painted, Interior Double Door w/ Safety Glass L			37					37					37					37					37		
Replace Steel, Painted, Interior Door Locks								2,004										2,004							
Maintain Steel, Painted, Interior Door Locks			138					138					138					138					138		
Refinish Steel, Painted, Interior Double Door w/ Safety Glass		118				118				118				118				118				118			
Replace Steel, Painted, w/ Safety Glass Interior Door Locks										334										334					
Refinish Steel, Painted, Interior Door		95		95		95		95		95		95		95		95		95		95		95		95	
C30 Interior Finishes																									
Replace Rubber Tile Flooring						808																		808	
Finish Repaired Steel, Painted, Interior Wall Finish			5																						
Repair Access Flooring w/ Carpet, Raised (2% of Floors)			932																						
Repair Access Flooring w/ Laminate, Raised (2% of Floors)			131																						
Replace Access Flooring w/ Carpet, Raised													46,580												
Replace Access Flooring w/ Laminate, Raised													6,544												
Replace Carpet on Access Flooring, Raised								12,148															12,148		
Repair Carpet, Nylon 20 oz., High Traffic (2% of Carpet)		60		60		60				60		60		60				60		60		60			
Repair Rubber Tile Flooring (2% of Floors)															16										
Repair Vinyl Tile Flooring (2% of Floors)										37															
Replace Vinyl Tile Flooring	2,547																		2,547						
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)					50	113			25						113			25					50		

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
B20 Exterior Enclosure																									
Replace Aluminum Operable Window, 12 sf, 1st Floor																									
Maintain Steel, Painted, Exterior Door Locks			23					23					23					23					23		
Replace Steel, Painted, Exterior Door Locks			349										349										349		
Refinish Steel, Painted, Exterior Door			31										31										31		
Repair Steel, Painted, Exterior Door													204												
Repair Aluminum Operable Window, 12 sf, 1st Floor		67															67								
B30 Roofing																									
Maintain Built-up Roof	95	95		95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Non-Destructive Moisture Inspection, Built-up Roof								162					162					162					162		
Place New Membrane Over Existing, Built-up Roof																		12,374							
Replace Membrane, Built-up Roof			26,159																						
C10 Interior Construction																									
Refinish Steel, Painted, w/ Safety Glass Interior Door			31				31				31				31				31				31		
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks					23					23					23					23					23
Replace Steel, Painted, Interior Double Door w/ Safety Glass			334										334										334		
Maintain Steel, Painted, Interior Double Door w/ Safety Glass			37					37					37					37					37		
Replace Steel, Painted, Interior Door Locks			2,004										2,004										2,004		
Maintain Steel, Painted, Interior Door Locks			138					138					138					138					138		
Refinish Steel, Painted, Interior Double Door w/ Safety Glass	118				118				118				118				118				118				118
Replace Steel, Painted, w/ Safety Glass Interior Door Locks					334										334										334
Refinish Steel, Painted, Interior Door	95		95		95		95		95		95		95		95		95		95		95		95		95
C30 Interior Finishes																									
Replace Rubber Tile Flooring																	808								
Finish Repaired Steel, Painted, Interior Wall Finish			5																						
Repair Access Flooring w/ Carpet, Raised (2% of Floors)			932																						
Repair Access Flooring w/ Laminate, Raised (2% of Floors)			131																						
Replace Access Flooring w/ Carpet, Raised													46,580												
Replace Access Flooring w/ Laminate, Raised													6,544												
Replace Carpet on Access Flooring, Raised								12,148															12,148		
Repair Carpet, Nylon 20 oz., High Traffic (2% of Carpet)	60		60		60				60		60		60				60		60		60				60
Repair Rubber Tile Flooring (2% of Floors)								16																	
Repair Vinyl Tile Flooring (2% of Floors)			37																		37				
Replace Vinyl Tile Flooring												2,547													
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)		25				50	113								50	113			25						113

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Acoustical Tile, Dropped Ceiling													2,478										5,697		
Repair Steel, Painted, Interior Wall Finish (2% of Walls)			129																						
Finish Repaired Clay Brick, Painted, Interior Wall Finish																									
Replace Carpet, Nylon 20 oz., High Traffic								3,003								3,003								3,003	
Repair Fabric, Interior Wall Finish (2% of Walls)								43																	
Repair Acoustical Tile, Interior Wall Finish (2% of Walls)																									
Replace Acoustical Wall Panels, Fabric Faced							5,294																		
Refinish Clay Brick, Painted, Interior Wall Finish							208															208			
Repair Clay Brick, Interior Wall Finish (2% of Walls)																									
Repoint (50% of surface) Clay Brick, Interior Wall Finish																									
Finish Replaced Clay Brick, Painted, Interior Wall Finish												208													
Replace Clay Brick, Interior Wall Finish												4,481													
Refinish Steel, Painted, Interior Wall Finish								265										265							
Replace Fabric, Interior Wall Finish																		2,036							
Refinish Gypsum Board, Interior Wall Finish								1,039		798								1,039		798					
Repair Gypsum Board, Interior Wall Finish (2% of Walls)								46												36					
Finish Repaired Gypsum Board, Interior Wall Finish								21												16					
Replace Gypsum Board, Interior Wall Finish																									
Finish Replaced Gypsum Board, Interior Wall Finish																									

D30 HVAC

Replace Pipe & Fittings, 1" Copper (20% of Pipe)																			1,440						
Replace Direct Digital Controls, System Points								24,370										24,370							
Replace 10' Section, Pipe & Fittings, 1" Copper														72											
Resolder Joint, Pipe & Fittings, 1" Copper				129										129											
Maintain Thermostat	116	116	116		116	116	116	116	116	116	116	116	116		116	116	116	116	116	116	116	116	116		116
Monitor Direct Digital Controls, System Points	1,014	1,014	1,014	1,014	1,014	1,014	1,014		1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014		1,014	1,014	1,014	1,014	1,014	1,014	1,014
Replace Air Conditioner, Computer Room, Chilled Water, 2 Ton																									
Repair Air Conditioner, Computer Room, Chilled Water, 2 Ton																		25,783							
Replace Existing Ductwork (20% of Ductwork)																								788	
Replace Duct Insulation (20% of Insulation)																								254	
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of Ins																			191						
Maintain Air Conditioner, Computer Room, Chilled Water, 2 To	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587
Replace Thermostat				1,615										1,615										1,615	
Re-tape Pipe Insulation, Fiberglass, Chilled Water				56					56					56										56	

D40 Fire Protection

Replace Fire Extinguisher						319												319							

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Acoustical Tile, Dropped Ceiling										1,267													2,478		
Repair Steel, Painted, Interior Wall Finish (2% of Walls)			129																						
Finish Repaired Clay Brick, Painted, Interior Wall Finish												4													
Replace Carpet, Nylon 20 oz., High Traffic							3,003								3,003								3,003		
Repair Fabric, Interior Wall Finish (2% of Walls)			43										43												
Repair Acoustical Tile, Interior Wall Finish (2% of Walls)						227																			
Replace Acoustical Wall Panels, Fabric Faced																	5,294								
Refinish Clay Brick, Painted, Interior Wall Finish							208										208								
Repair Clay Brick, Interior Wall Finish (2% of Walls)												90													
Repoint (50% of surface) Clay Brick, Interior Wall Finish												1,120													
Finish Replaced Clay Brick, Painted, Interior Wall Finish																									
Replace Clay Brick, Interior Wall Finish																									
Refinish Steel, Painted, Interior Wall Finish			265										265										265		
Replace Fabric, Interior Wall Finish																							2,036		
Refinish Gypsum Board, Interior Wall Finish			1,039		798								1,039		798										798
Repair Gypsum Board, Interior Wall Finish (2% of Walls)			46												36										
Finish Repaired Gypsum Board, Interior Wall Finish			21												16										
Replace Gypsum Board, Interior Wall Finish																		2,328							
Finish Replaced Gypsum Board, Interior Wall Finish																		1,039							
D30 HVAC																									
Replace Pipe & Fittings, 1" Copper (20% of Pipe)																			1,440						
Replace Direct Digital Controls, System Points			24,370										24,370										24,370		
Replace 10' Section, Pipe & Fittings, 1" Copper														72											
Resolder Joint, Pipe & Fittings, 1" Copper				129										129											
Maintain Thermostat	116	116	116	116	116	116	116	116		116	116	116	116	116	116	116	116	116		116	116	116	116	116	116
Monitor Direct Digital Controls, System Points	1,014	1,014		1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014		1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014		1,014	1,014
Replace Air Conditioner, Computer Room, Chilled Water, 2 To												67,127													
Repair Air Conditioner, Computer Room, Chilled Water, 2 Ton																									
Replace Existing Ductwork (20% of Ductwork)																									788
Replace Duct Insulation (20% of Insulation)																									254
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of In																			191						
Maintain Air Conditioner, Computer Room, Chilled Water, 2 T	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587		2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587
Replace Thermostat									1,615										1,615						
Re-tape Pipe Insulation, Fiberglass, Chilled Water				56					56					56										56	
D40 Fire Protection																									
Replace Fire Extinguisher					319												319								

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Inspect & Test Fire Extinguisher				35							35					35							35		
D50 Electrical																									
Replace Fire Alarm Horn & Strobe			532																				532		
Repair Wiring Device, Switch				242				531											242				531		
Replace Electric Lock				2,291										2,291										2,291	
Replace Access Card Reader w/ Keypad				8,713										8,713										8,713	
Replace Wiring Device, Switch									227				499											227	
Maintain Intrusion Detection Motion Detector, Interior	45	45	45		45	45	45	45	45	45	45	45	45		45	45	45	45	45	45	45	45	45		45
Replace Batteries & Check Operation, Smoke Detector	237	237	237	237	237	237	237		237	237	237	237	237	237	237	237	237	237	237	237	237	237		237	237
Maintain Card Reader w/ Keypad	634	634	634		634	634	634	634	634	634	634	634	634		634	634	634	634	634	634	634	634	634		634
Replace Intrusion Detection Motion Detector, Interior				697										697										697	
Check & Repair Manual Pull Station			257																				257		
Replace Manual Pull Station													607												
Replace Monitor, Small, Closed Circuit										53,873										53,873					
Replace Monitor, Large, Closed Circuit										51,140										51,140					
Replace Receptacle, 120 V, 20 Amp.														420											
Replace Public Address Speaker													2,347												
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/ Ba													168												
Repair Smoke Detector																		600							
Maintain Public Address Speaker	210	210	210	210	210	210	210	210	210	210	210	210		210	210	210	210	210	210	210	210	210	210	210	210
Replace Power Panel Board, 208 Y/120 V, 225 Amp.																								6,915	
Replace Smoke Detector								1,761															1,761		
Maintain Disconnect Switch, 30 Amp.	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30	30	30
Repair Disconnect Switch, 30 Amp.								187																	
Replace Disconnect Switch, 30 Amp.																		437							
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	91	181	181	181	181	181	181	181
Repair Power Panel Board, 208 Y/120 V, 100 Amp.								285										143							
Replace Power Panel Board, 208 Y/120 V, 100 Amp.																		4,582							
Replace Lamp, Exit Lighting Fixture, w/ Battery								318					318					318							
Repair Power Panel Board, 208 Y/120 V, 225 Amp.				143				143						143				143							
Replace Receptacle, 120 V, 15 Amp.														648				1,513							
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/ B	318				318		318		318		318		318		318		318		318		318				318
Replace Emergency Lighting Pack, 2 Light w/ Battery			4,587																				4,587		
Replace Exit Lighting Fixture, w/ Battery			1,527																				1,527		
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-3				743																				743	
Replace Fluorescent Lighting Fixture, T8, 2-32 w														1,164											
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 2-													6,951												

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Inspect & Test Fire Extinguisher			35							35					35							35			
D50 Electrical																									
Replace Fire Alarm Horn & Strobe																		532							
Repair Wiring Device, Switch									242				531											242	
Replace Electric Lock									2,291										2,291						
Replace Access Card Reader w/ Keypad									8,713										8,713						
Replace Wiring Device, Switch			499											227				499							
Maintain Intrusion Detection Motion Detector, Interior	45	45	45	45	45	45	45	45		45	45	45	45	45	45	45	45	45		45	45	45	45	45	45
Replace Batteries & Check Operation, Smoke Detector	237	237	237	237	237	237	237	237	237	237	237	237		237	237	237	237	237	237	237	237	237	237	237	237
Maintain Card Reader w/ Keypad	634	634	634	634	634	634	634	634		634	634	634	634	634	634	634	634	634		634	634	634	634	634	634
Replace Intrusion Detection Motion Detector, Interior									697										697						
Check & Repair Manual Pull Station													257												
Replace Manual Pull Station			607															607							
Replace Monitor, Small, Closed Circuit					53,873										53,873										53,873
Replace Monitor, Large, Closed Circuit					51,140										51,140										51,140
Replace Receptacle, 120 V, 20 Amp.									420																
Replace Public Address Speaker			2,347															2,347							
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/								168																	
Repair Smoke Detector								600															600		
Maintain Public Address Speaker	210	210		210	210	210	210	210	210	210	210	210	210	210	210	210	210		210	210	210	210	210	210	210
Replace Power Panel Board, 208 Y/120 V, 225 Amp.			6,915																						
Replace Smoke Detector													1,761												
Maintain Disconnect Switch, 30 Amp.	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Repair Disconnect Switch, 30 Amp.			187										187										187		
Replace Disconnect Switch, 30 Amp.																									
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	181	181	91	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	91	181	181
Repair Power Panel Board, 208 Y/120 V, 100 Amp.			143										285										143		
Replace Power Panel Board, 208 Y/120 V, 100 Amp.			4,582																				4,582		
Replace Lamp, Exit Lighting Fixture, w/ Battery			318					318					318										318		
Repair Power Panel Board, 208 Y/120 V, 225 Amp.									143				143						143				143		
Replace Receptacle, 120 V, 15 Amp.									648				1,513												
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/		318		318		318		318		318		318		318		318				318		318		318	
Replace Emergency Lighting Pack, 2 Light w/ Battery																		4,587							
Replace Exit Lighting Fixture, w/ Battery																		1,527							
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-																			743						
Replace Fluorescent Lighting Fixture, T8, 2-32 w									1,164																
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 2								6,951																	

Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Fluorescent Lighting Fixture, T12, 2-40 w			11,450																				11,450		
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	91	181

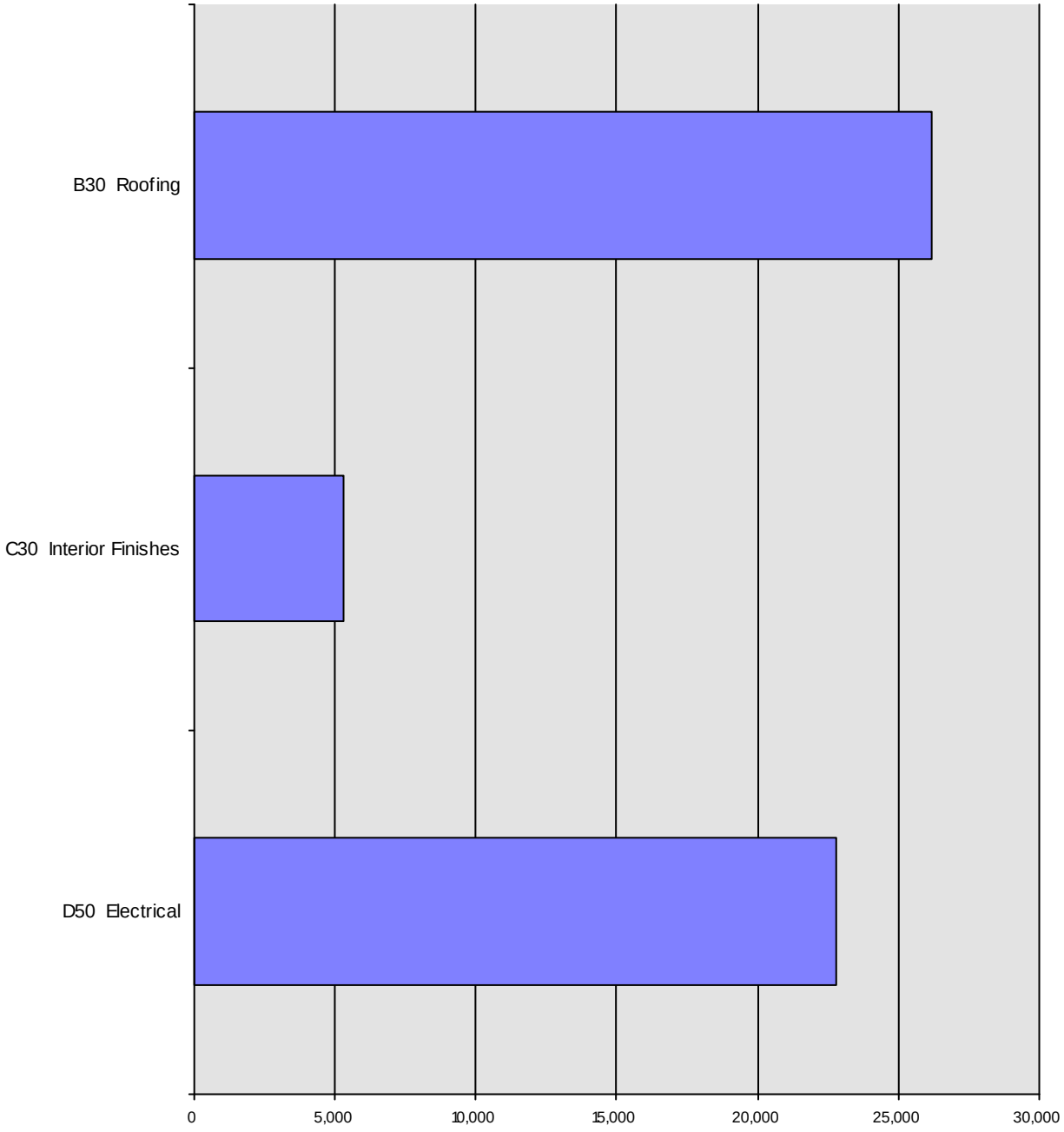
Building: Research & Control Building **Facility:** Glenn Research Center

Building Num: 0054 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Fluorescent Lighting Fixture, T12, 2-40 w																		11,450							
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	181	181	91	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181

Building Deferred Maintenance by System Chart

Building: Research & Control Building **Building Num:** 0054



All costs expressed in ($) 2012. Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral and is included in Total Deferred Maintenance.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: Research & Control Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $16,363,138
per SF: $5,642

Building Type: Data Center
Building Gsft: 2,900
Building Number: 0054

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1980	3	Replace Membrane, Built-up Roof	$26,159	$0	$26,159
1980	3	Replace Power Panel Board, 208 Y/120 V, 225 Amp.	$6,915	$0	$6,915
1949	29	Replace Acoustical Wall Panels, Fabric Faced	$5,294	$0	$5,294
1980	3	Replace Power Panel Board, 208 Y/120 V, 100 Amp.	$4,582	$0	$4,582
1970	13	Replace Power Panel Board, 208 Y/120 V, 100 Amp.	$4,582	$0	$4,582
1995	3	Replace Public Address Speaker	$2,347	$0	$2,347
1990	8	Replace Smoke Detector	$1,761	$0	$1,761
1990	3	Replace Receptacle, 120 V, 15 Amp.	$1,513	$0	$1,513
1995	3	Replace Manual Pull Station	$607	$0	$607
1980	18	Replace Wiring Device, Switch	$499	$0	$499
		Total	**$54,260**	**$0**	**$54,260**

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Operations Task Details

Whitestone Research

Building: Research & Control Building **Year Built:** 1949 **Building Type:** Data Center

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0054

City: Cleveland, OH **Replacement Value:** $16,363,138 **per SF:** $5,642 **Building Gsft:** 2,900

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Custodial		**Level of Service: Low**			
Computer Room	2494	Damp Wipe Surfaces with Trigger Sprayer & Cloth	$422	$69	$491
Computer Room	2494	Wet Mop & Rinse Hard Floor with 32 oz. Mop Using Double Bucket & Wringer	$330	$54	$383
Computer Room	2494	Sweep Hard Floor with 36" Push Broom	$241	$39	$281
Computer Room	2494	Empty Trash; Wipe Clean & Re-line Basket	$143	$23	$166
Conference Room	406	Vacuum Carpet with 14" Upright Vacuum	$163	$26	$189
Conference Room	406	Clean and Wipe Furniture with Trigger Sprayer & Cloth	$62	$10	$72
Conference Room	406	Empty Trash; Wipe Clean & Re-line Basket	$23	$4	$27
Total:			**$1,384**	**$225**	**$1,609**
Operation: Grounds		**Level of Service: Medium**			
Grounds, Improved	1740	Mow Turfgrass with 21" Power Mower	$101	$42	$144
Grounds, Improved	1740	Aerate Improved Grounds	$93	$38	$131
Grounds, Improved	1740	Clear Shrubs	$62	$26	$88
Grounds, Improved	1740	Overseed, Improved Grounds	$46	$19	$66
Grounds, Improved	1740	Edge Clean & Trim Walks with Gas Powered Edger	$39	$16	$55
Grounds, Improved	1740	Vacuum with 30" Billy Goat	$31	$13	$44
Grounds, Improved	1740	Clear Crabgrass	$23	$10	$33
Grounds, Improved	1740	Clear Weeds with 15" Boom, Improved Grounds	$12	$5	$17
Grounds, Improved	1740	Fertilize Improved Grounds	$9	$4	$13
Grounds, Improved	1740	Trim Around Raised Objects with String Edger	$8	$3	$11
Grounds, Improved	1740	Sweep with 30" Power Rake	$6	$3	$9
Grounds, Improved	1740	Fertilize Using Power Take Off Broadcast	$0	$0	$0
Total:			**$431**	**$179**	**$610**
Operation: Pest Control		**Level of Service: Medium**			
Pest Controlled	2900	Install, or Check and Re-Bait 5 Rodent Boxes	$79	$33	$112
Pest Controlled	2900	Perform Crawling Insect Abatement	$59	$25	$84
Pest Controlled	2900	Inspect Building for Pests	$33	$0	$33

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Total:			**$171**	**$57**	**$229**
Operation: Road Clearance		**Level of Service: Medium**			
Pavement NASA	2320	Plow Paved Area	$178	$54	$232
Total:			**$178**	**$54**	**$232**
Operation: Security		**Level of Service: Medium**			
Secured Area	2900	Patrol Building Perimeter	$490	$80	$570
Secured Area	2900	Guard Lobby/Parking	$0	$0	$0
Total:			**$490**	**$80**	**$570**

Building Operations Service Details

Whitestone Research

Building: Research & Control Building **Year Built:** 1949 **FTEs:** 3 **Building Type:** Data Center

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0054

City: Cleveland, OH **Replacement Value:** $16,363,138 **per SF:** $5,642 **Building Gsft:** 2,900

	Service*	Quantity	Rate	Cost
Operation: Security	**Level of Service: Medium**			
	Intrusion Detection Systems	1	$4,986	$4,986
	System Monitoring	1	$3,615	$3,615
	Access Control	1	$2,690	$2,690
	Total:			**$11,291**
Operation: Telecom	**Level of Service: High**			
	Local Telephone	3	$468	$1,404
	Data	3	$3,588	$721
	Long Distance Telephone	3	$192	$576
	Total:			**$2,701**

All costs expressed in ($) 2012.

19-Dec-14

* Secutity may be composed of service and task based cost. See Building Operations Task Details for Security Tasks.

Building Operations Management Details

Whitestone Research

Building: Research & Control Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $16,363,138 **per SF:** $5,642

Building Type: Data Center
Building Num: 0054
Building Gsft: 2,900

	Service	Demand	UM	PRV	Cost
Operation: Management	**Level of Service: Low**				
	Management	0.3%	PRV	$16,363,138	$40,908
	Total:				**$40,908**

Average M&R Costs

Whitestone Research

Building: SWT Air Dryer Building
Building Number: 0057
Facility: Glenn Research Center
City: Cleveland, OH

GSFT: 54,111
PRV: $19,746,852
Built Date: 1949

M&R Average Annual Cost Forecasts

	Current Year	5 Year	20 Year	50 Year
PM & Minor Repair:	$114,249	$110,654	$106,268	$106,720
Unscheduled Maintenance:	$41,681	$39,954	$36,913	$37,342
Renewal & Replacement:	$15,829	$29,229	$211,651	$150,777
Total M&R Costs:	$171,759	$179,837	$354,832	$294,839
Per GSFT:	$3.17	$3.32	$6.56	$5.45
As % of PRV:	0.87%	0.91%	1.80%	1.49%

All costs expressed in ($) 2012.
Based on a 50-Year Forecast.

Building Component List

Whitestone Research

Building: SWT Air Dryer Building **Year Built:** 1949 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0057

City: Cleveland, OH **Replacement Value:** $19,746,852 **per SF:** $365 **Building Gsft:** 54,111

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
B1010		Metal Decking	1949	500 Sq Ft		
B1020		Steel Roof Access Ladder	1949	30 Ln Ft	Exterior	
B1020		Steel Roof Access Ladder	1949	70 Ln Ft	Interior	
B2010		Steel, Exterior, 1st Floor	1949	4875 Sq Ft		
B2010		Steel, Exterior, 2nd Floor	1949	4875 Sq Ft		
B2030		Dryer Door	1949	2 Each		
B2030		Steel w/ Safety Glass, Painted, Exterior Door	1949	2 Each		
B2030		Steel, Exterior Door	1949	5 Each		
B2030		Steel, Painted, Exterior Double Door	1949	2 Each		
B2030		Vault Door	1949	1 Each		
B3010		Aluminum Gutter, Downspouts, Fittings	1949	0.355 K Ln Ft		
B3010		Metal Roof	1949	5760 Sq Ft		
C1020		Steel, Interior Door	1949	6 Each		
C2010		Metal, Painted, Exterior Railing	1949	40 Ln Ft		
C2010		Metal, Painted, Exterior Stairs	1949	128 Sq Ft		
C2010		Metal, Painted, Interior Railing	1949	56 Ln Ft		
C2010		Metal, Painted, Interior Stairs	1949	208 Sq Ft		
C3010		Concrete Block, Painted, Interior Wall Finish	1949	1760 Sq Ft		
C3010		Concrete, Painted, Interior Wall Finish	1949	2720 Sq Ft		
C3010		Steel, Interior Wall Finish	1949	11270 Sq Ft		
C3020		Clay Brick Flooring	1949	5420 Sq Ft		
C3020		Concrete Flooring	1949	10368 Sq Ft		
C3020		Steel Flooring	1949	1200 Sq Ft		
C3020		Steel Perforated Flooring, Raised	1949	1382 Sq Ft		
C3020		Vinyl Tile Flooring	1949	614 Sq Ft		
C3030		Acoustical Tile, Dropped Ceiling	1949	615 Sq Ft		
C3030		Concrete Ceiling	1949	5760 Sq Ft		
C3030		Metal Ceiling	1949	12100 Sq Ft		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D2010		Lavatory, Vitreous China	1980	1 Each		
D2010		Service Sink, Vitreous China	1980	1 Each		
D2010		Tankless Water Closet	1980	1 Each		
D2010		Urinal, Vitreous China	1980	1 Each		
D2020		Pipe & Fittings, 3/4" Copper, Cold Water	1980	0.15 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Cold Water	1980	0.15 K Ln Ft		
D2030		Floor Drain	1949	6 Each		
D2030		Floor Drain	1949	3 Each		2x2
D2030		Pipe & Fittings, 3" Cast Iron	1949	0.35 K Ln Ft		
D2030		Pipe & Fittings, 4" Cast Iron	1949	0.25 K Ln Ft		
D2040		Sump Pump, 1/2 HP	2010	1 Each		
D2090	§	Ball Valve, 2"	1980	1 Each		
D2090		Gate Valve, 2-3"	1995	40 Each		Combustion air; sliding
D2090		Gate Valve, 2-3"	1980	1 Each		
D2090		Gate Valve, 4"	1980	1 Each		
D3010		Flow Control Valve, Motorized, 4"	2000	20 Each		
D3010		Natural Gas Pump, 1/4 HP	2005	1 Each		
D3010		Pipe & Fittings, 2" Steel, Gas	1990	0.75 K Ln Ft		
D3010		Pipe & Fittings, 4" Steel, Gas	1990	0.375 K Ln Ft		
D3010		Pressure Reducer Valve, 2"	1990	40 Each		
D3020		Condensate Receiver Station, 10-15 Gal.	2000	1 Each		
D3020		Condensate Receiver Station, 10-15 Gal.	1949	1 Each		
D3020		Furnace, Electric, 25 Mbh	2013	1 Each	Control Rm	
D3020		Gas Burner, 8,000 Mbh	1949	20 Each		
D3020		Pipe & Fittings, 1" Steel	1949	0.1 K Ln Ft		
D3020		Pipe & Fittings, 1" Steel	1990	0.1 K Ln Ft		
D3020		Steam Trap, F&T, 1"	1949	1 Each		
D3030		Circulation Pump, 5 HP, Chiller & Condenser Water	1949	1 Each		
D3030		Condenser, Air-Cooled, 1 Ton	2013	1 Each	Control Rm	
D3030		Flow Control Valve, Motorized, 12"	2005	1 Each		
D3030		Flow Control Valve, Motorized, 4"	2005	1 Each		
D3030		Flow Control Valve, Motorized, 6"	2005	1 Each		
D3030		Gate Valve, 12"	2000	1 Each		
D3030		Gate Valve, 16"	1949	2 Each		New Motor
D3030		Gate Valve, 2-3"	2000	1 Each		
D3030		Gate Valve, 2-3"	1949	1 Each		New Motor

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D3030		Gate Valve, 2-3"	1949	0.2 Each		
D3030		Gate Valve, 2-3"	2000	0.175 Each		
D3030		Gate Valve, 6"	1949	1 Each		
D3030		Pipe & Fittings, 12" Steel	1949	0.12 K Ln Ft		
D3030		Pipe & Fittings, 12" Steel	2005	0.1 K Ln Ft		
D3030		Pipe & Fittings, 4" Steel	1949	0.12 K Ln Ft		
D3030		Pipe & Fittings, 4" Steel	2005	0.15 K Ln Ft		
D3030		Pipe & Fittings, 6" Steel	1949	0.125 K Ln Ft		
D3030		Pipe & Fittings, 6" Steel	2005	0.1 K Ln Ft		
D3030		Strainer, Cast Iron, 16"	1949	0.075 Each		
D3030		Water Storage Tank, 250 Gal.	1949	1 Each		
D3040		Air Handler, Multizone, 6,500 Cfm	1992	1 Each		Make-up Air
D3040		Duct Insulation, Fiberglass Blanket	1992	150 Sq Ft		
D3040		Duct Insulation, Fiberglass Blanket	2013	100 Sq Ft		
D3040		Ductwork	1992	250 Lbs		
D3040		Ductwork	2013	150 Lbs		
D3050		Radiator, Wall, Cast Iron	1949	3 Ln Ft		
D3050		Unit Heater, 12 Mbh	1949	1 Each		
D3060		Direct Digital Controls, System Points	2010	693 Each		
D3060		Thermostat	2013	1 Each		
D3060		Thermostat	1992	1 Each		
D4010		Fire Alarm Control Panel	1995	1 Each		
D5010		Circuit Breaker, 600 V, 30-60 Amp., 3Ph.	1985	4 Each		
D5010		Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	1985	10 Each		
D5010		Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.	1985	4 Each		
D5010		Disconnect Switch, 30 Amp.	2013	1 Each		
D5010		Disconnect Switch, 30 Amp.	2010	1 Each		
D5010		Disconnect Switch, 60 Amp.	1949	1 Each		
D5010		Disconnect Switch, 60 Amp.	1985	2 Each		
D5010		Motor Control Center w/ Main Breaker, 480 V, 1200 Amp.	1985	1 Each		
D5010	PMCC02	Motor Control Center w/ Main Breaker, 480 V, 600 Amp.	1985	1 Each		
D5010		Motor Starter, <5HP, <600V	1949	3 Each		
D5010		Motor Starter, 5-20 HP, <600 V	1949	1 Each		
D5010	P0101	Power Panel Board, 208 Y/120 V, 100 Amp.	1949	1 Each		
D5010	PTR010, P0102	Power Panel Board, 208 Y/120 V, 200 Amp.	1949	2 Each		
D5010	P01	Power Panel Board, 208 Y/120 V, 400 Amp.	1949	1 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D5010	G5D1A1A1	Secondary Transformer, Dry, 112-1/2 kVA	1990	1 Each		
D5010	GRM1C1B	Secondary Transformer, Dry, 15 kVA	1990	1 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1995	7 Each		
D5020		Exit Lighting Fixture, w/ Battery	1990	4 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1995	21 Each		
D5020		High Pressure Sodium Lighting Fixture, 250 w	2000	2 Each		
D5020		Incandescent Lighting Fixture, Basic, 200 w	1960	17 Each		
D5020		Incandescent Lighting Fixture, Basic, 100 w	1960	1 Each		
D5020		Metal Halide Lighting Fixture, High Bay, 400 w	2000	25 Each		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150 w	1995	2 Each		
D5020		Receptacle, 120 V, 15 Amp.	1949	40 Each		
D5020		Wiring Device, Switch	1949	25 Each		
D5030		Fire Alarm Horn & Strobe	1995	8 Each		
D5030		Manual Pull Station	1995	1 Each		
D5030		Public Address Speaker	1995	4 Each		
D5030		Smoke Detector	1995	5 Each		
F1030		8x6 Air Dryer	1949	1 Each		
F1030		8x6 Dryer #1 CA Blower Motor Disc Panel	1949	1 Each		
F1030		8x6 Dryer #2 CA Blower Motor Disc Panel	1949	1 Each		
F1030		8x6 Dryer #3 CA Blower Motor Disc Panel	1949	1 Each		
F1030		8x6 Dryer 208 VAC MCC	1949	1 Each		
F1030		8x6 Dryer Axial Blower Fan Assembly	1949	1 Each		
F1030		8x6 Dryer Burner Gas Valves	1949	1 Each		
F1030		8x6 Dryer Coil Trap	1949	1 Each		
F1030		8x6 Dryer Combustion Air Blower Motor	1949	1 Each		
F1030		8x6 Dryer Compressor Plenum Vent Fan	1949	1 Each		
F1030		8x6 Dryer Cross-Over Valve	1949	1 Each		
F1030		8x6 Dryer CW Cross-Over Valve	1949	1 Each		
F1030		8x6 Dryer CW Drain Valve 1	1949	1 Each		
F1030		8x6 Dryer CW Drain Valve 2	1949	1 Each		
F1030		8x6 Dryer Damper Door	1949	1 Each		
F1030		8x6 Dryer Downstream Filter	1949	1 Each		
F1030		8x6 Dryer DPU/Interconnect Cabinet	1949	1 Each		
F1030		8x6 Dryer Exhaust Fans	1949	1 Each		
F1030		8x6 Dryer Gas Strainer	1949	1 Each		
F1030		8x6 Dryer Hardwire	1949	1 Each		

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
F1030		8x6 Dryer Makeup Air Vents	1949	1 Each		
F1030		8x6 Dryer NG Main Gas Valve	1949	1 Each		
F1030		8x6 Dryer Return Pump/Motor	1949	1 Each		
F1030		8x6 Dryer Sliding Door	1949	1 Each		
F1030		8x6 Dryer Upstream Air Filter	1949	1 Each		
F1030		8x6 Main Gas Regulating Valve	1949	1 Each		
F1030		8x6 Return/Supply Valve Bldg 57	1949	1 Each		
F1030		8x6 Thermography Bldg 57	1949	1 Each		
F1030		8x6 Thermography Bldg 57	1949	1 Each		
F1030		9x15 Air Dryer Dessicant	2010	1 Each		

Building Extended Component List with Remaining Service Life

Whitestone Research 04-Jun-15

Building: SWT Air Dryer Building **Year Built:** 1949 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0057

City: Cleveland, OH **Replacement Value:** $19,746,852 **per SF:** $365 **Building Gsft:** 54,111

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
B1010		Metal Decking	1949	-35	500 Sq Ft	$11,145	$0	$11,145		
B1020		Steel Roof Access Ladder	1949	-25	30 Ln Ft	$2,542	$0	$2,542	Exterior	
B1020		Steel Roof Access Ladder	1949	-25	70 Ln Ft	$5,931	$0	$5,931	Interior	
B2010		Steel, Exterior, 1st Floor	1949	10	4875 Sq Ft					
B2010		Steel, Exterior, 2nd Floor	1949	10	4875 Sq Ft					
B2030		Dryer Door	1949	-30	2 Each	$370,805	$0	$370,805		
B2030		Steel w/ Safety Glass, Painted, Exterior Door	1949	10	2 Each					
B2030		Steel, Exterior Door	1949	10	5 Each					
B2030		Steel, Painted, Exterior Double Door	1949	10	2 Each					
B2030		Vault Door	1949	10	1 Each					
B3010		Aluminum Gutter, Downspouts, Fittings	1949	-45	0.355 K Ln Ft	$2,683	$0	$2,683		
B3010		Metal Roof	1949	-25	5760 Sq Ft	$64,501	$0	$64,501		
C1020		Steel, Interior Door	1949	10	6 Each					
C2010		Metal, Painted, Exterior Railing	1949	-35	40 Ln Ft	$2,015	$0	$2,015		
C2010		Metal, Painted, Exterior Stairs	1949	-15	128 Sq Ft	$5,063	$0	$5,063		
C2010		Metal, Painted, Interior Railing	1949	-15	56 Ln Ft	$1,696	$0	$1,696		
C2010		Metal, Painted, Interior Stairs	1949	10	208 Sq Ft					
C3010		Concrete Block, Painted, Interior Wall Finish	1949	10	1760 Sq Ft					
C3010		Concrete, Painted, Interior Wall Finish	1949	10	2720 Sq Ft					
C3010		Steel, Interior Wall Finish	1949	10	11270 Sq Ft					
C3020		Clay Brick Flooring	1949	10	5420 Sq Ft					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
C3020		Concrete Flooring	1949	10	10368 Sq Ft					
C3020		Steel Flooring	1949	10	1200 Sq Ft					
C3020		Steel Perforated Flooring, Raised	1949	-25	1382 Sq Ft	$40,064	$0	$40,064		
C3020		Vinyl Tile Flooring	1949	-47	614 Sq Ft	$2,793	$0	$2,793		
C3030		Acoustical Tile, Dropped Ceiling	1949	-30	615 Sq Ft	$2,002	$0	$2,002		
C3030		Concrete Ceiling	1949	10	5760 Sq Ft					
C3030		Metal Ceiling	1949	10	12100 Sq Ft					
D2010		Lavatory, Vitreous China	1980	1	1 Each					
D2010		Service Sink, Vitreous China	1980	1	1 Each					
D2010		Tankless Water Closet	1980	1	1 Each					
D2010		Urinal, Vitreous China	1980	1	1 Each					
D2020		Pipe & Fittings, 3/4" Copper, Cold Water	1980	-9	0.15 K Ln Ft	$760	$0	$760		
D2020		Pipe Insulation, Fiberglass, Cold Water	1980	-9	0.15 K Ln Ft	$144	$0	$144		
D2030		Floor Drain	1949	-25	3 Each	$983	$0	$983		2x2
D2030		Floor Drain	1949	-25	6 Each	$1,965	$0	$1,965		
D2030		Pipe & Fittings, 3" Cast Iron	1949	10	0.35 K Ln Ft					
D2030		Pipe & Fittings, 4" Cast Iron	1949	10	0.25 K Ln Ft					
D2040		Sump Pump, 1/2 HP	2010	16	1 Each					
D2090	§	Ball Valve, 2"	1980	-17	1 Each	$615	$0	$615		
D2090		Gate Valve, 2-3"	1980	-17	1 Each	$581	$0	$581		
D2090		Gate Valve, 2-3"	1995	4	40 Each					Combustion air; sliding
D2090		Gate Valve, 4"	1980	-17	1 Each	$1,873	$0	$1,873		
D3010		Flow Control Valve, Motorized, 4"	2000	22	20 Each					
D3010		Natural Gas Pump, 1/4 HP	2005	4	1 Each					
D3010		Pipe & Fittings, 2" Steel, Gas	1990	51	0.75 K Ln Ft					
D3010		Pipe & Fittings, 4" Steel, Gas	1990	51	0.375 K Ln Ft					
D3010		Pressure Reducer Valve, 2"	1990	-19	40 Each	$34,862	$0	$34,862		
D3020		Condensate Receiver Station, 10-15 Gal.	1949	-53	1 Each	$6,956	$0	$6,956		

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3020		Condensate Receiver Station, 10-15 Gal.	2000	-2	1 Each	$6,956	$0	$6,956		
D3020		Furnace, Electric, 25 Mbh	2013	11	1 Each				Control Rm	
D3020		Gas Burner, 8,000 Mbh	1949	-25	20 Each	$324,717	$0	$324,717		
D3020		Pipe & Fittings, 1" Steel	1949	10	0.1 K Ln Ft					
D3020		Pipe & Fittings, 1" Steel	1990	51	0.1 K Ln Ft					
D3020		Steam Trap, F&T, 1"	1949	-57	1 Each	$369	$0	$369		
D3030		Circulation Pump, 5 HP, Chiller & Condenser	1949	-33	1 Each	$4,075	$0	$4,075		
D3030		Condenser, Air-Cooled, 1 Ton	2013	31	1 Each				Control Rm	
D3030		Flow Control Valve, Motorized, 12"	2005	27	1 Each					
D3030		Flow Control Valve, Motorized, 4"	2005	27	1 Each					
D3030		Flow Control Valve, Motorized, 6"	2005	27	1 Each					
D3030		Gate Valve, 12"	2000	1	1 Each					
D3030		Gate Valve, 16"	1949	4	2 Each					New Motor
D3030		Gate Valve, 2-3"	2000	1	0.175 Each					
D3030		Gate Valve, 2-3"	2000	1	1 Each					
D3030		Gate Valve, 2-3"	1949	-50	0.2 Each	$117	$0	$117		
D3030		Gate Valve, 2-3"	1949	4	1 Each					New Motor
D3030		Gate Valve, 6"	1949	-50	1 Each	$2,685	$0	$2,685		
D3030		Pipe & Fittings, 12" Steel	2005	66	0.1 K Ln Ft					
D3030		Pipe & Fittings, 12" Steel	1949	10	0.12 K Ln Ft					
D3030		Pipe & Fittings, 4" Steel	1949	10	0.12 K Ln Ft					
D3030		Pipe & Fittings, 4" Steel	2005	66	0.15 K Ln Ft					
D3030		Pipe & Fittings, 6" Steel	1949	10	0.125 K Ln Ft					
D3030		Pipe & Fittings, 6" Steel	2005	66	0.1 K Ln Ft					
D3030		Strainer, Cast Iron, 16"	1949	-50	0.075 Each	$774	$0	$774		
D3030		Water Storage Tank, 250 Gal.	1949	-45	1 Each	$2,602	$0	$2,602		
D3040		Air Handler, Multizone, 6,500 Cfm	1992	-6	1 Each	$20,165	$0	$20,165		Make-up Air
D3040		Duct Insulation, Fiberglass Blanket	2013	25	100 Sq Ft					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3040		Duct Insulation, Fiberglass Blanket	1992	4	150 Sq Ft					
D3040		Ductwork	2013	25	150 Lbs					
D3040		Ductwork	1992	4	250 Lbs					
D3050		Radiator, Wall, Cast Iron	1949	-30	3 Ln Ft	$454	$0	$454		
D3050		Unit Heater, 12 Mbh	1949	-33	1 Each	$761	$0	$761		
D3060		Direct Digital Controls, System Points	2010	6	693 Each					
D3060		Thermostat	2013	9	1 Each					
D3060		Thermostat	1992	-12	1 Each	$404	$0	$404		
D4010		Fire Alarm Control Panel	1995	-4	1 Each	$3,726	$0	$3,726		
D5010		Circuit Breaker, 600 V, 30-60 Amp., 3Ph.	1985	21	4 Each					
D5010		Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	1985	21	10 Each					
D5010		Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.	1985	21	4 Each					
D5010		Disconnect Switch, 30 Amp.	2010	46	1 Each					
D5010		Disconnect Switch, 30 Amp.	2013	49	1 Each					
D5010		Disconnect Switch, 60 Amp.	1985	21	2 Each					
D5010		Disconnect Switch, 60 Amp.	1949	-15	1 Each	$870	$0	$870		
D5010		Motor Control Center w/ Main Breaker, 480 V,	1985	-9	1 Each	$25,425	$0	$25,425		
D5010	PMCC02	Motor Control Center w/ Main Breaker, 480 V,	1985	-9	1 Each	$21,413	$0	$21,413		
D5010		Motor Starter, <5HP, <600V	1949	-47	3 Each	$2,108	$0	$2,108		
D5010		Motor Starter, 5-20 HP, <600 V	1949	-47	1 Each	$860	$0	$860		
D5010	P0101	Power Panel Board, 208 Y/120 V, 100 Amp.	1949	-35	1 Each	$4,582	$0	$4,582		
D5010	PTR010, P0102	Power Panel Board, 208 Y/120 V, 200 Amp.	1949	-35	2 Each	$13,063	$0	$13,063		
D5010	P01	Power Panel Board, 208 Y/120 V, 400 Amp.	1949	-35	1 Each	$8,240	$0	$8,240		
D5010	G5D1A1A1	Secondary Transformer, Dry, 112-1/2 kVA	1990	6	1 Each					
D5010	GRM1C1B	Secondary Transformer, Dry, 15 kVA	1990	6	1 Each					
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1995	1	7 Each					
D5020		Exit Lighting Fixture, w/ Battery	1990	-4	4 Each	$1,527	$0	$1,527		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	1995	1	21 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5020		High Pressure Sodium Lighting Fixture, 250 w	2000	6	2 Each					
D5020		Incandescent Lighting Fixture, Basic, 200 w	1960	-34	17 Each	$2,645	$0	$2,645		
D5020		Incandescent Lighting Fixture, Basic, 100 w	1960	-34	1 Each	$156	$0	$156		
D5020		Metal Halide Lighting Fixture, High Bay, 400 w	2000	6	25 Each					
D5020		Metal Halide Lighting Fixture, Wall Mount, 150	1995	1	2 Each					
D5020		Receptacle, 120 V, 15 Amp.	1949	-45	40 Each	$2,161	$0	$2,161		
D5020		Wiring Device, Switch	1949	-50	25 Each	$1,133	$0	$1,133		
D5030		Fire Alarm Horn & Strobe	1995	1	8 Each					
D5030		Manual Pull Station	1995	-4	1 Each	$151	$0	$151		
D5030		Public Address Speaker	1995	-4	4 Each	$1,340	$0	$1,340		
D5030		Smoke Detector	1995	-4	5 Each	$880	$0	$880		
F1030		8x6 Air Dryer	1949	NA	1 Each					
F1030		8x6 Dryer #1 CA Blower Motor Disc Panel	1949	NA	1 Each					
F1030		8x6 Dryer #2 CA Blower Motor Disc Panel	1949	NA	1 Each					
F1030		8x6 Dryer #3 CA Blower Motor Disc Panel	1949	NA	1 Each					
F1030		8x6 Dryer 208 VAC MCC	1949	NA	1 Each					
F1030		8x6 Dryer Axial Blower Fan Assembly	1949	NA	1 Each					
F1030		8x6 Dryer Burner Gas Valves	1949	NA	1 Each					
F1030		8x6 Dryer Coil Trap	1949	NA	1 Each					
F1030		8x6 Dryer Combustion Air Blower Motor	1949	NA	1 Each					
F1030		8x6 Dryer Compressor Plenum Vent Fan	1949	NA	1 Each					
F1030		8x6 Dryer Cross-Over Valve	1949	NA	1 Each					
F1030		8x6 Dryer CW Cross-Over Valve	1949	NA	1 Each					
F1030		8x6 Dryer CW Drain Valve 1	1949	NA	1 Each					
F1030		8x6 Dryer CW Drain Valve 2	1949	NA	1 Each					
F1030		8x6 Dryer Damper Door	1949	NA	1 Each					
F1030		8x6 Dryer Downstream Filter	1949	NA	1 Each					
F1030		8x6 Dryer DPU/Interconnect Cabinet	1949	NA	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
F1030		8x6 Dryer Exhaust Fans	1949	NA	1 Each					
F1030		8x6 Dryer Gas Strainer	1949	NA	1 Each					
F1030		8x6 Dryer Hardwire	1949	NA	1 Each					
F1030		8x6 Dryer Makeup Air Vents	1949	NA	1 Each					
F1030		8x6 Dryer NG Main Gas Valve	1949	NA	1 Each					
F1030		8x6 Dryer Return Pump/Motor	1949	NA	1 Each					
F1030		8x6 Dryer Sliding Door	1949	NA	1 Each					
F1030		8x6 Dryer Upstream Air Filter	1949	NA	1 Each					
F1030		8x6 Main Gas Regulating Valve	1949	NA	1 Each					
F1030		8x6 Return/Supply Valve Bldg 57	1949	NA	1 Each					
F1030		8x6 Thermography Bldg 57	1949	NA	1 Each					
F1030		8x6 Thermography Bldg 57	1949	NA	1 Each					
F1030		9x15 Air Dryer Dessicant	2010	16	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Forecast Year: 2013

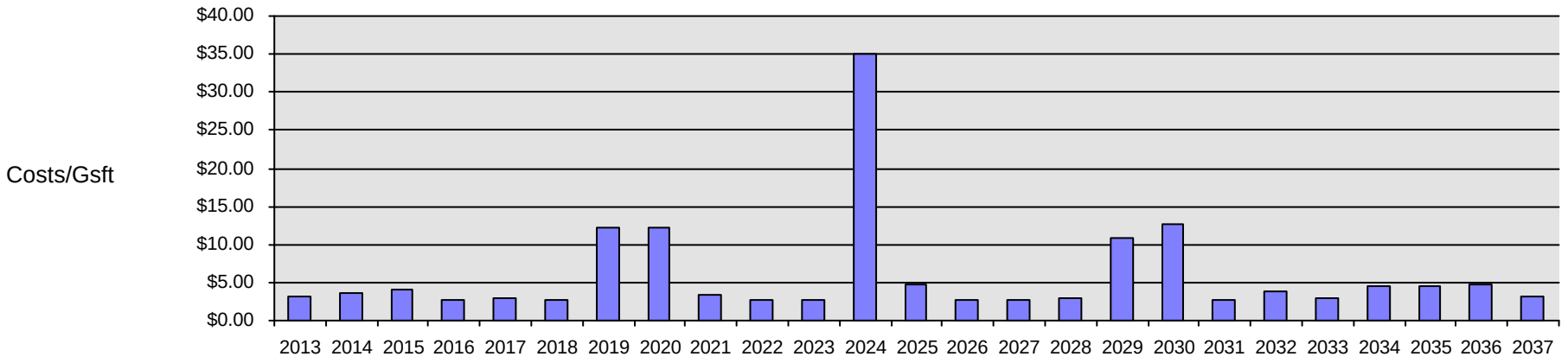
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: SWT Air Dryer Building **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0057 **GSFT:** 54111

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
A10 Foundations																									
A20 Basement Construction																									
B10 Super Structure							0.01					0.05					0.17								
B20 Exterior Enclosure	0.00	0.01	0.00	0.00	0.00	0.00	7.18	0.00	0.00	0.00	0.00	7.11	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00
B30 Roofing	0.03	0.06	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	0.03	1.24	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03
C10 Interior Construction		0.01					0.04					0.10					0.01					0.04			
C20 Stairs	0.01				0.01		0.00		0.01			0.17	0.00			0.00	0.01			0.00	0.00			0.00	0.00
C30 Interior Finishes	0.34				0.20		0.14		0.39			23.37				0.20	0.74	0.00		0.34		0.10		0.20	0.00
D10 Conveying																									
D20 Plumbing	0.02	0.08	0.08	0.02	0.02	0.02	0.45	0.02	0.03	0.02	0.02	0.14	0.03	0.02	0.07	0.02	0.06	0.04	0.08	0.02	0.02	0.02	0.08	0.46	0.02
D30 HVAC	1.61	2.28	2.27	1.53	1.54	1.53	3.10	10.39	1.65	1.50	1.51	2.88	2.19	1.50	1.51	1.53	6.92	10.51	1.53	2.30	1.67	3.09	2.16	2.83	1.88
D40 Fire Protection	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
D50 Electrical	0.09	0.07	0.70	0.07	0.09	0.09	0.12	0.77	0.13	0.07	0.09	0.11	1.34	0.07	0.11	0.07	0.14	0.41	0.09	0.07	0.11	0.10	1.24	0.09	0.09
E10 Equipment																									
E20 Furnishings																									
F10 Special Construction	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.75	1.07	1.07	1.07	1.07	1.07	1.07	1.07
F20 Selective Bldg Demolition																									
G10 Site Preparation																									
G20 Site Improvements																									
G30 Site Mechanical Utilities																									
G40 Site Electrical Utilities																									
G90 Other Site Construction																									
Total	**3.17**	**3.58**	**4.16**	**2.73**	**2.97**	**2.75**	**12.19**	**12.30**	**3.32**	**2.70**	**2.73**	**35.06**	**4.73**	**2.70**	**2.79**	**2.94**	**10.90**	**12.76**	**2.80**	**3.85**	**2.92**	**4.59**	**4.59**	**4.69**	**3.10**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 1-25

Based on a 50-Year Forecast.

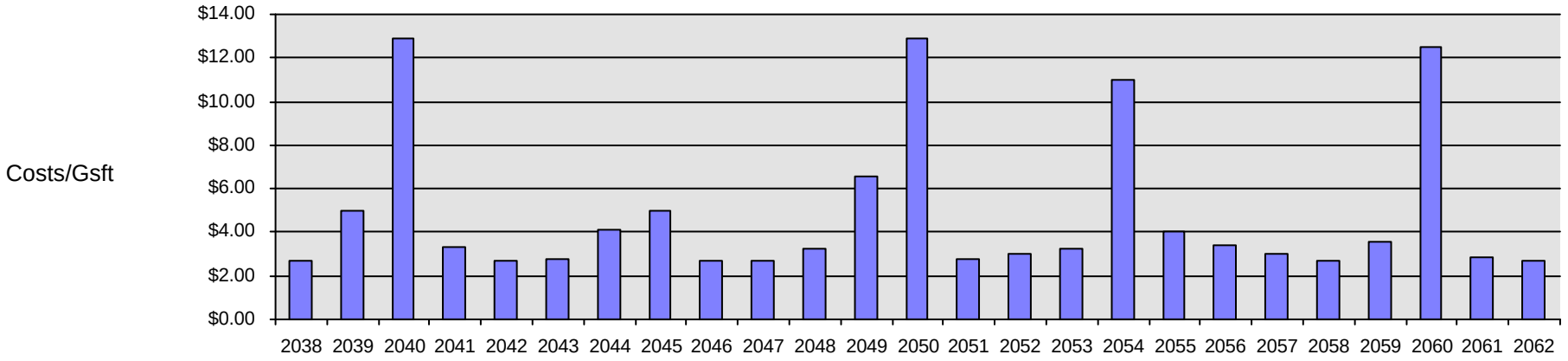
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: SWT Air Dryer Building **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0057 **GSFT:** 54111

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2	**Total**
A10 Foundations																										**0.00**
A20 Basement Construction																										**0.00**
B10 Super Structure		0.21					0.05					0.01										0.06				**0.55**
B20 Exterior Enclosure	0.00	0.57	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	7.22	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	**23.71**
B30 Roofing	0.03	0.06	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	0.03	0.12	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	**2.96**
C10 Interior Construction		0.01					0.04					0.01					0.04					0.01				**0.31**
C20 Stairs		0.06	0.00	0.00			0.00	0.00			0.00	0.13			0.00	0.00	0.01		0.00	0.00		0.00	0.00	0.00		**0.45**
C30 Interior Finishes		0.09	0.34				0.32		0.00		0.34	1.14			0.20		0.18		0.34	0.05		0.01	0.20			**29.29**
D10 Conveying																										**0.00**
D20 Plumbing	0.02	0.03	0.02	0.02	0.02	0.03	0.07	0.03	0.02	0.03	0.08	0.02	0.09	0.02	0.07	0.45	0.02	0.04	0.02	0.02	0.02	0.02	0.04	0.07	0.02	**3.15**
D30 HVAC	1.50	2.29	10.76	2.12	1.50	1.51	2.29	2.54	1.49	1.50	1.61	3.23	10.36	1.55	1.53	1.55	2.29	2.11	1.88	1.67	1.49	2.22	10.63	1.58	1.51	**144.10**
D40 Fire Protection	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.00	**0.45**
D50 Electrical	0.07	0.62	0.55	0.09	0.09	0.09	0.07	1.32	0.07	0.09	0.09	0.18	0.65	0.11	0.07	0.09	0.11	0.71	0.07	0.13	0.07	0.10	0.54	0.09	0.07	**12.51**
E10 Equipment																										**0.00**
E20 Furnishings																										**0.00**
F10 Special Construction	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.75	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	**54.96**
F20 Selective Bldg Demolition																										**0.00**
G10 Site Preparation																										**0.00**
G20 Site Improvements																										**0.00**
G30 Site Mechanical Utilities																										**0.00**
G40 Site Electrical Utilities																										**0.00**
G90 Other Site Construction																										**0.00**
Total	**2.70**	**5.00**	**12.86**	**3.34**	**2.72**	**2.73**	**4.08**	**5.01**	**2.69**	**2.72**	**3.25**	**6.59**	**12.90**	**2.79**	**2.99**	**3.20**	**11.00**	**4.03**	**3.44**	**2.99**	**2.70**	**3.57**	**12.53**	**2.84**	**2.71**	**272.44**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 26-50

Based on a 50-Year Forecast.

Building: SWT Air Dryer Building

Facility: Glenn Research Center

Building Num: 0057

City: Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
B10 Super Structure																									
Repair Metal Decking (2% of Decking)																	222								
Replace Metal Decking																									
Repair Steel Roof Access Ladder												2,469													
Replace Steel Roof Access Ladder																	8,474								
Refinish Metal Decking							625										625								
B20 Exterior Enclosure																									
Replace Digital Lock, Vault Door							1,620															1,620			
Replace Steel, Painted, Exterior Double Door												4,301													
Finish Replaced Steel, Painted, Exterior Double Door												106													
Maintain Steel w/ Safety Glass, Painted, Exterior Door Locks		45					45										45					45			
Replace Steel w/ Safety Glass, Painted, Exterior Door Locks							699															699			
Refinish Steel w/ Safety Glass, Painted, Exterior Door							64															64			
Repair Steel w/ Safety Glass, Painted, Exterior Door																									
Replace Steel w/ Safety Glass, Painted, Exterior Door												2,622													
Repair Steel, Painted, Exterior Double Door																									
Maintain Vault Door Locks	104	104	104	104	104	104	104	104	104	104	104		104	104	104	104	104	104	104	104	104	104	104	104	104
Maintain Steel, Painted, Exterior Double Door Locks		45					45										45					45			
Repair Vault Door																									
Replace Vault Door												17,796													
Finish Replaced Steel w/ Safety Glass, Painted, Exterior Door												64													
Finish Dryer Door							11,740																		
Repair Steel, Exterior, 1st Floor (2% of Walls)																									
Replace Steel, Exterior, 1st Floor												169,618													
Repair Steel, Exterior, 2nd Floor (2% of Walls)																									
Replace Steel, Exterior, 2nd Floor												185,359													
Repair Dryer Door																	15,873								
Refinish Steel, Painted, Exterior Double Door							106															106			
Replace Dryer Door							370,805																		
Maintain Steel, Exterior Door Locks		114					114										114					114			
Replace Steel, Exterior Door Locks							1,746															1,746			
Repair Steel, Exterior Door																									
Replace Steel, Exterior Door												4,815													
Replace Steel, Painted, Exterior Double Door Locks							699															699			
Refinish Dryer Door																	11,740								
B30 Roofing																									

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
B10 Super Structure																									
Repair Metal Decking (2% of Decking)																						222			
Replace Metal Decking		11,145																							
Repair Steel Roof Access Ladder							2,469															2,469			
Replace Steel Roof Access Ladder																									
Refinish Metal Decking												625										625			
B20 Exterior Enclosure																									
Replace Digital Lock, Vault Door							1,620										1,620								
Replace Steel, Painted, Exterior Double Door																									
Finish Replaced Steel, Painted, Exterior Double Door																									
Maintain Steel w/ Safety Glass, Painted, Exterior Door Locks		45					45					45					45					45			
Replace Steel w/ Safety Glass, Painted, Exterior Door Locks							699										699								
Refinish Steel w/ Safety Glass, Painted, Exterior Door							64										64								
Repair Steel w/ Safety Glass, Painted, Exterior Door		407															407								
Replace Steel w/ Safety Glass, Painted, Exterior Door																									
Repair Steel, Painted, Exterior Double Door		761															761								
Maintain Vault Door Locks	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104
Maintain Steel, Painted, Exterior Double Door Locks		45					45					45					45					45			
Repair Vault Door												1,406													
Replace Vault Door																									
Finish Replaced Steel w/ Safety Glass, Painted, Exterior Door																									
Finish Dryer Door																	11,740								
Repair Steel, Exterior, 1st Floor (2% of Walls)												3,392													
Replace Steel, Exterior, 1st Floor																									
Repair Steel, Exterior, 2nd Floor (2% of Walls)												3,707													
Replace Steel, Exterior, 2nd Floor																									
Repair Dryer Door		15,873										15,873													
Refinish Steel, Painted, Exterior Double Door							106										106								
Replace Dryer Door																	370,805								
Maintain Steel, Exterior Door Locks		114					114					114					114					114			
Replace Steel, Exterior Door Locks							1,746										1,746								
Repair Steel, Exterior Door		1,018															1,018								
Replace Steel, Exterior Door																									
Replace Steel, Painted, Exterior Double Door Locks							699										699								
Refinish Dryer Door		11,740										11,740													
B30 Roofing																									

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Metal Roof		1,457					1,457					1,457										1,457			
Minor Replacement, Metal Roof (2% of Roof)																									
Replace Metal Roof																	64,501								
Maintain Aluminum Gutter, Downspouts, Fittings	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	120	120	120	120
Replace Aluminum Gutter, Downspouts, Fittings																	2,683								
Maintain Metal Roof	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632		632	632	632	632	632	632	632	632
C10 Interior Construction																									
Replace Steel, Interior Door Locks							2,003															2,003			
Replace Steel, Interior Door												5,587													
Maintain Steel, Interior Door Locks		137					137										137					137			
C20 Stairs																									
Replace Metal, Painted, Exterior Stairs																									
Finish Replaced Metal, Painted, Interior Stairs												259													
Replace Metal, Painted, Interior Stairs												8,227													
Finish Repaired Metal, Painted, Interior Stairs																									
Repair Metal, Painted, Interior Stairs																									
Finish Replaced Metal, Painted, Exterior Stairs																									
Finish Repaired Metal, Painted, Exterior Stairs												4													
Repair Metal, Painted, Exterior Stairs												336													
Refinish Metal, Painted, Exterior Stairs							160										160								
Repair Metal, Painted, Exterior Railing												72													
Refinish Metal, Painted, Interior Stairs	259				259				259							259				259				259	
Finish Replaced Metal, Painted, Interior Railing																									
Refinish Metal, Painted, Exterior Railing							54										54								
Finish Repaired Metal, Painted, Exterior Railing												1													
Replace Metal, Painted, Exterior Railing																									
Finish Replaced Metal, Painted, Exterior Railing																									
Refinish Metal, Painted, Interior Railing	70				70				70				70				70				70				70
Repair Metal, Painted, Interior Railing												102													
Finish Repaired Metal, Painted, Interior Railing												2													
Replace Metal, Painted, Interior Railing																									
C30 Interior Finishes																									
Replace Metal Ceiling												379,264													
Repair Vinyl Tile Flooring (2% of Floors)																		41							
Repair Steel Flooring (2% of Walls)																									
Replace Steel Flooring												14,817													

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Metal Roof		1,457					1,457					1,457					1,457					1,457			
Minor Replacement, Metal Roof (2% of Roof)												1,290													
Replace Metal Roof																									
Maintain Aluminum Gutter, Downspouts, Fittings	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	120	120	120	120	120	120	120	120	120
Replace Aluminum Gutter, Downspouts, Fittings												2,683													
Maintain Metal Roof	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632
C10 Interior Construction																									
Replace Steel, Interior Door Locks							2,003										2,003								
Replace Steel, Interior Door																									
Maintain Steel, Interior Door Locks		137					137					137					137					137			
C20 Stairs																									
Replace Metal, Painted, Exterior Stairs												5,063													
Finish Replaced Metal, Painted, Interior Stairs																									
Replace Metal, Painted, Interior Stairs																									
Finish Repaired Metal, Painted, Interior Stairs		8															8								
Repair Metal, Painted, Interior Stairs		546															546								
Finish Replaced Metal, Painted, Exterior Stairs												160													
Finish Repaired Metal, Painted, Exterior Stairs		4																							
Repair Metal, Painted, Exterior Stairs		336																							
Refinish Metal, Painted, Exterior Stairs		160																				160			
Repair Metal, Painted, Exterior Railing																	72								
Refinish Metal, Painted, Interior Stairs			259				259				259				259				259				259		
Finish Replaced Metal, Painted, Interior Railing												70													
Refinish Metal, Painted, Exterior Railing												54										54			
Finish Repaired Metal, Painted, Exterior Railing																	1								
Replace Metal, Painted, Exterior Railing		2,015																							
Finish Replaced Metal, Painted, Exterior Railing		50																							
Refinish Metal, Painted, Interior Railing				70				70								70				70				70	
Repair Metal, Painted, Interior Railing		102																							
Finish Repaired Metal, Painted, Interior Railing		2																							
Replace Metal, Painted, Interior Railing												1,696													
C30 Interior Finishes																									
Replace Metal Ceiling																									
Repair Vinyl Tile Flooring (2% of Floors)											41														
Repair Steel Flooring (2% of Walls)												955													
Replace Steel Flooring																									

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair (2% of Floors) Steel Perforated Flooring, Raised												801													
Replace Steel Perforated Flooring, Raised																	40,064								
Replace Concrete Flooring												103,723													
Replace Vinyl Tile Flooring									2,793																
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)																40									40
Replace Acoustical Tile, Dropped Ceiling							2,002																		
Repair Concrete Ceiling (2% of Ceiling)																									
Repair Metal Ceiling (2% of Ceiling)	7,538								7,538											7,538					
Repoint (50% of surface) Clay Brick Flooring																									
Repair Concrete Flooring (2% of Floors)																									
Replace Concrete Ceiling												164,886													
Refinish Concrete, Painted, Interior Wall Finish							3,433															3,433			
Replace Clay Brick Flooring												115,183													
Repair Clay Brick Flooring (2% of Floors)																									
Repoint (50% surface) Concrete Block, Painted, Interior Wall Fi																									
Finish Repaired Concrete Block, Painted, Interior Wall Finish																									
Finish Replaced Concrete Block, Painted, Interior Wall Finish												2,222													
Repair Concrete Block, Painted, Interior Wall Finish (2% of Wal																									
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)																									
Finish Repaired Concrete, Painted, Interior Wall Finish																									
Replace Concrete, Painted, Interior Wall Finish												89,271													
Finish Replaced Concrete, Painted, Interior Wall Finish												3,433													
Repair Steel, Interior Wall Finish (2% of Walls)																									
Replace Steel, Interior Wall Finish												362,059													
Clean & Seal Clay Brick Flooring	7,456				7,456				7,456							7,456				7,456				7,456	
Refinish Concrete Block, Painted, Interior Wall Finish							2,222															2,222			
Replace Concrete Block, Painted, Interior Wall Finish												28,983													

D20 Plumbing

Inspect & Lubricate Sump Pump, 1/2 HP	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32		32	32	32	32	32	32	32
Replace 10' Section, Pipe & Fittings, 3" Cast Iron									149															149	
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron																									
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)												2,973													
Replace Floor Drain																	2,947								
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron																									
Overhaul Sump Pump, 1/2 HP			66					66					66										66		
Replace Pump & Motor Assembly, Sump Pump, 1/2 HP																		478							
Lubricate, Repack Gland, Ball Valve, 2"	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair (2% of Floors) Steel Perforated Flooring, Raised							801															801			
Replace Steel Perforated Flooring, Raised																									
Replace Concrete Flooring																									
Replace Vinyl Tile Flooring		2,793																		2,793					
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)									40																
Replace Acoustical Tile, Dropped Ceiling																	2,002								
Repair Concrete Ceiling (2% of Ceiling)												3,284													
Repair Metal Ceiling (2% of Ceiling)			7,538								7,538								7,538						
Repoint (50% of surface) Clay Brick Flooring												36,051													
Repair Concrete Flooring (2% of Floors)		2,075															2,075								
Replace Concrete Ceiling																									
Refinish Concrete, Painted, Interior Wall Finish							3,433										3,433								
Replace Clay Brick Flooring																									
Repair Clay Brick Flooring (2% of Floors)												2,932													
Repoint (50% surface) Concrete Block, Painted, Interior Wall												6,883													
Finish Repaired Concrete Block, Painted, Interior Wall Finish												44													
Finish Replaced Concrete Block, Painted, Interior Wall Finish																									
Repair Concrete Block, Painted, Interior Wall Finish (2% of W												580													
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)												1,768													
Finish Repaired Concrete, Painted, Interior Wall Finish												69													
Replace Concrete, Painted, Interior Wall Finish																									
Finish Replaced Concrete, Painted, Interior Wall Finish																									
Repair Steel, Interior Wall Finish (2% of Walls)												9,077													
Replace Steel, Interior Wall Finish																									
Clean & Seal Clay Brick Flooring			7,456				7,456				7,456				7,456				7,456				7,456		
Refinish Concrete Block, Painted, Interior Wall Finish							2,222										2,222								
Replace Concrete Block, Painted, Interior Wall Finish																									

D20 Plumbing

Inspect & Lubricate Sump Pump, 1/2 HP	32	32	32	32	32	32	32	32	32	32	32	32		32	32	32	32	32	32	32	32	32	32	32	32
Replace 10' Section, Pipe & Fittings, 3" Cast Iron											149												149		
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron												60													
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)																									
Replace Floor Drain																									
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron												60													
Overhaul Sump Pump, 1/2 HP			66					66										66					66		
Replace Pump & Motor Assembly, Sump Pump, 1/2 HP													478												
Lubricate, Repack Gland, Ball Valve, 2"	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Ball Valve, 2"		615																	615						
Repack Gland, Gate Valve, 2-3"										63					2,513			63					2,513		
Maintain Floor Drain	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307		307	307	307	307	307	307	307	307
Repack Gland, Gate Valve, 4"										63								63							
Replace 10' Section, Pipe & Fittings, 4" Cast Iron									186															186	
Replace Gate Valve, 4"		1,873																	1,873						
Replace Gate Valve, 2-3"		581					23,221												581				23,221		
Replace Washer & Spud Connection, Lavatory, Vitreous China										46							46							46	
Replace Pipe & Fittings, 4" Cast Iron (20% of Pipe)												3,721													
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insula																		144							
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chin		29			29		29		29		29		29		29		29		29		29		29		29
Replace Valve Set, Lavatory, Vitreous China													148										148		
Replace Lavatory, Vitreous China			502																						
Replace Faucet Washer & Clean Trap, Service Sink, Vitreous		29			29		29		29		29		29		29		29		29		29		29		29
Repair Strainer, Service Sink, Vitreous China											84								84						
Replace Valve Set, Service Sink, Iron, EnamelService Sink, Vitr													148										148		
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Cold Water								38																	
Replace Flush Valve, Tankless Water Closet													29										29		
Replace Tankless Water Closet			691																						
Replace Flush Valve, Urinal, Vitreous China										161							161							161	
Replace Urinal, Vitreous China			945																						
Resolder Joint, Pipe & Fittings, 3/4" Copper, Cold Water								77																	
Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pipe																		760							
Re-tape Pipe Insulation, Fiberglass, Cold Water			42					42					42										42		
Replace Service Sink, Vitreous China			1,143																						

D30 HVAC

Repair Gas Burner, 8,000 Mbh		38,989					38,989					38,989										38,989			
Inspect & Test Gas Burner, 8,000 Mbh	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098		20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098
Replace Furnace, Electric, 25 Mbh													2,736												2,736
Maintain Furnace, Electric, 25 Mbh		132	132	132	132	132	132	132	132	132	132	132		132	132	132	132	132	132	132	132	132	132	132	
Replace Pipe & Fittings, 1" Steel (20% of Pipe)												381													
Replace Condensate Receiver Station, 10-15 Gal.									6,956			6,956									6,956			6,956	
Repair Furnace, Electric, 25 Mbh									1,362												1,362				
Replace Gas Burner, 8,000 Mbh																	324,717								
Replace Steam Trap, F&T, 1"	369								369								369								369
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel			15																						
Maintain Steam Trap, F&T, 1"		44	44	44	44	44	44	44		44	44	44	44	44	44	44		44	44	44	44	44	44	44	

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Ball Valve, 2"											615														
Repack Gland, Gate Valve, 2-3"		63					2,513			63					2,513				63					2,513	
Maintain Floor Drain	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307
Repack Gland, Gate Valve, 4"		63								63									63						
Replace 10' Section, Pipe & Fittings, 4" Cast Iron											186												186		
Replace Gate Valve, 4"											1,873														
Replace Gate Valve, 2-3"											581					23,221									
Replace Washer & Spud Connection, Lavatory, Vitreous Chin						46														46					
Replace Pipe & Fittings, 4" Cast Iron (20% of Pipe)																									
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insul																		144							
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chi		29		29		29		29		29		29			29		29		29		29		29		29
Replace Valve Set, Lavatory, Vitreous China								148															148		
Replace Lavatory, Vitreous China													502												
Replace Faucet Washer & Clean Trap, Service Sink, Vitreous		29		29		29		29		29		29			29		29		29		29		29		29
Repair Strainer, Service Sink, Vitreous China		84								84											84				
Replace Valve Set, Service Sink, Iron, EnamelService Sink, Vi								148															148		
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Cold Water													38												
Replace Flush Valve, Tankless Water Closet								29															29		
Replace Tankless Water Closet													691												
Replace Flush Valve, Urinal, Vitreous China						161														161					
Replace Urinal, Vitreous China													945												
Resolder Joint, Pipe & Fittings, 3/4" Copper, Cold Water			77										77												
Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pip																		760							
Re-tape Pipe Insulation, Fiberglass, Cold Water			42					42					42										42		
Replace Service Sink, Vitreous China													1,143												

D30 HVAC

Repair Gas Burner, 8,000 Mbh		38,989					38,989					38,989					38,989					38,989			
Inspect & Test Gas Burner, 8,000 Mbh	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098	20,098
Replace Furnace, Electric, 25 Mbh												2,736												2,736	
Maintain Furnace, Electric, 25 Mbh	132	132	132	132	132	132	132	132	132	132	132		132	132	132	132	132	132	132	132	132	132	132		132
Replace Pipe & Fittings, 1" Steel (20% of Pipe)																									
Replace Condensate Receiver Station, 10-15 Gal.								6,956			6,956									6,956			6,956		
Repair Furnace, Electric, 25 Mbh								1,362												1,362					
Replace Gas Burner, 8,000 Mbh																									
Replace Steam Trap, F&T, 1"								369								369								369	
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel			15									15													
Maintain Steam Trap, F&T, 1"	44	44	44	44	44	44	44		44	44	44	44	44	44	44		44	44	44	44	44	44	44		44

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Condensate Receiver Station, Motor, 10-15 Gal.	1,969			1,969	1,969			1,969					1,969			1,969	1,969			1,969					1,969
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel, Gas			114																						
Replace 10' Section, Pipe & Fittings, 1" Steel		19							19					19										19	
Repair Condensate Receiver Station, 10-15 Gal.	523	523	523	523	523	523	523	523		523	523		523	523	523	523	523	523	523	523		523	523		523
Maintain Condensate Receiver Station, 10-15 Gal.	175	175	175	175	175	175	175	175	87	175	175	87	175	175	175	175	175	175	175	175	87	175	175	87	175
Replace Pressure Reducer Valve, 2"			34,862					34,862					34,862					34,862					34,862		
Maintain Pressure Reducer Valve, 2"	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159
Replace Flow Control Valve, Motorized, 4"																								69,131	
Replace Valve Actuator, 4"																				41,205					
Maintain Flow Control Valve & Actuator, 4"	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159		2,159
Replace 10' Section, Pipe & Fittings, 4" Steel, Gas		191												191											
Replace 10' Section, Pipe & Fittings, 2" Steel, Gas		192												192											
Replace Natural Gas Pump, 1/4 HP						1,568													1,568						
Repair Natural Gas Pump, 1/4 HP		370													370										
Maintain Natural Gas Pump, 1/4 HP	30	30	30	30	30		30	30	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30	30
Maintain Circulation Pump, 5 HP, Chiller & Condenser Water		53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel, Gas			92																						
Repair Air Handler, Multizone, 6,500 Cfm		2,831																					2,831		
Repack Gland, Gate Valve, 6"	63								63											63					
Replace Gate Valve, 6"												2,685													
Repack Gland, Gate Valve, 12"											63														
Repack Gland, Gate Valve, 16"	126														126										
Replace Gate Valve, 12"			7,876															7,876							
Replace Gate Valve, 16"							46,895																46,895		
Maintain Water Storage Tank, 250 Gal.	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129		129	129	129	129	129	129	129	129
Replace Water Storage Tank, 250 Gal.																	2,602								
Maintain Strainer, Cast Iron, 16"	4	4	4	4	4	4	4	4	4	4	4		4	4	4	4	4	4	4	4	4	4	4	4	4
Replace Gate Valve, 2-3"			683				581					117						683					581		
Maintain Air Handler, Multizone, 6,500 Cfm	563	563	563	563	563	563	563	563	563	563	563		563	563	563	563	563	563	563	563	563	563	563	563	563
Repair Unit Heater, 12 Mbh																					530				
Replace Air Handler, Multizone, 6,500 Cfm												20,165													
Replace Duct Insulation (20% of Insulation)						168																			
Replace Existing Ductwork (20% of Ductwork)						564																			
Replace Radiator, Wall, Cast Iron							454																		
Maintain Unit Heater, 12 Mbh		161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
Replace Unit Heater, 12 Mbh	761																								
Replace Direct Digital Controls, System Points								482,541										482,541							

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Condensate Receiver Station, Motor, 10-15 Gal.			1,969	1,969			1,969					1,969			1,969	1,969			1,969					1,969	
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel, Gas			114																						
Replace 10' Section, Pipe & Fittings, 1" Steel	19										19		19										19		19
Repair Condensate Receiver Station, 10-15 Gal.	523	523	523	523	523	523	523		523	523		523	523	523	523	523	523	523	523		523	523		523	523
Maintain Condensate Receiver Station, 10-15 Gal.	175	175	175	175	175	175	175	87	175	175	87	175	175	175	175	175	175	175	175	87	175	175	87	175	175
Replace Pressure Reducer Valve, 2"			34,862					34,862					34,862					34,862					34,862		
Maintain Pressure Reducer Valve, 2"	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159	1,159	1,159		1,159	1,159
Replace Flow Control Valve, Motorized, 4"																									
Replace Valve Actuator, 4"																									
Maintain Flow Control Valve & Actuator, 4"	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159	2,159
Replace 10' Section, Pipe & Fittings, 4" Steel, Gas	191												191												191
Replace 10' Section, Pipe & Fittings, 2" Steel, Gas	192												192												192
Replace Natural Gas Pump, 1/4 HP							1,568													1,568					
Repair Natural Gas Pump, 1/4 HP			370													370									
Maintain Natural Gas Pump, 1/4 HP	30	30	30	30	30	30		30	30	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30
Maintain Circulation Pump, 5 HP, Chiller & Condenser Water	53	53	53	53	53	53	53		53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel, Gas			92																						
Repair Air Handler, Multizone, 6,500 Cfm														2,831											
Repack Gland, Gate Valve, 6"										63															63
Replace Gate Valve, 6"		2,685															2,685								
Repack Gland, Gate Valve, 12"	63															63									
Repack Gland, Gate Valve, 16"					126															126					
Replace Gate Valve, 12"								7,876															7,876		
Replace Gate Valve, 16"												46,895													
Maintain Water Storage Tank, 250 Gal.	129	129	129	129	129	129	129	129	129	129	129		129	129	129	129	129	129	129	129	129	129	129	129	129
Replace Water Storage Tank, 250 Gal.												2,602													
Maintain Strainer, Cast Iron, 16"	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4		4	4	4	4	4	4	4	4
Replace Gate Valve, 2-3"		117						683				581					117						683		
Maintain Air Handler, Multizone, 6,500 Cfm	563	563		563	563	563	563	563	563	563	563	563	563	563	563	563	563	563		563	563	563	563	563	563
Repair Unit Heater, 12 Mbh																									
Replace Air Handler, Multizone, 6,500 Cfm			20,165																20,165						
Replace Duct Insulation (20% of Insulation)		112					168																		
Replace Existing Ductwork (20% of Ductwork)		338					564																		
Replace Radiator, Wall, Cast Iron																	454								
Maintain Unit Heater, 12 Mbh	161	161	161	161	161	161	161		161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
Replace Unit Heater, 12 Mbh								761																	
Replace Direct Digital Controls, System Points			482,541									482,541											482,541		

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Maintain Thermostat	29	58	58	58	58	58	58	58	58	29	29	58	58	58	58	58	58	58	58	29	29	58	58	58	58
Replace Thermostat										404	404									404	404				
Repair Steam Trap, F&T, 1"			424		424		424				424		424		424				424		424		424		
Replace Valve, Non-Drain, 16"												774													
Repair Condenser, Air-Cooled, 1 Ton																					947				
Repair Circulation Pump, 5 HP, Chiller & Condenser Water																	109								
Monitor Direct Digital Controls, System Points	20,071	20,071	20,071	20,071	20,071	20,071	20,071		20,071	20,071	20,071	20,071	20,071	20,071	20,071	20,071	20,071		20,071	20,071	20,071	20,071	20,071	20,071	20,071
Repack Gland, Gate Valve, 2-3"	76								13		73				63					13					
Replace Circulation Pump, 5 HP, Chiller & Condenser Water	4,075																								
Maintain Condenser, Air-Cooled, 1 Ton		158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158
Replace Condenser, Air-Cooled, 1 Ton																									
Maintain Flow Control Valve & Actuator, 4"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Valve Actuator, 4"																									2,061
Replace Flow Control Valve, Motorized, 4"																									
Maintain Flow Control Valve & Actuator, 6"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Valve Actuator, 6"																									4,895
Replace Flow Control Valve, Motorized, 6"																									
Replace Pipe & Fittings, 6" Steel (20% of Pipe)												1,602													
Replace Valve Actuator, 12"																									9,337
Replace Flow Control Valve, Motorized, 12"																									
Replace 10' Section, Pipe & Fittings, 4" Steel					77				62								77							62	
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel																		37							
Replace Pipe & Fittings, 4" Steel (20% of Pipe)												1,223													
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel																		33							
Replace 10' Section, Pipe & Fittings, 6" Steel					64				80								64							80	
Replace 10' Section, Pipe & Fittings, 12" Steel					159				190								159							190	
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel																		32							
Maintain Flow Control Valve & Actuator, 12"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Pipe & Fittings, 12" Steel (20% of Pipe)												3,798													
D40 Fire Protection																									
Replace Fire Alarm Control Panel													3,726												
Repair Fire Alarm Control Panel			161					161										161					161		
Inspect & Test Fire Alarm Control Panel	193	193	193	193	193	193	193	193	193	193	193	193		193	193	193	193	193	193	193	193	193	193	193	193
D50 Electrical																									
Repair Secondary Transformer, Dry, 112-1/2 kVA																		327							
Replace Ballast & Lamp, HP Sodium Lighting Fixture, 250 w																		780							

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Maintain Thermostat	58	58	58	58	29	29	58	58	58	58	58	58	58	58	29	29	58	58	58	58	58	58	58	58	29
Replace Thermostat					404	404									404	404									404
Repair Steam Trap, F&T, 1"		424		424		424				424		424		424				424		424		424			
Replace Valve, Non-Drain, 16"		774															774								
Repair Condenser, Air-Cooled, 1 Ton																									
Repair Circulation Pump, 5 HP, Chiller & Condenser Water																								109	
Monitor Direct Digital Controls, System Points	20,071	20,071		20,071	20,071	20,071	20,071	20,071	20,071	20,071	20,071	20,071		20,071	20,071	20,071	20,071	20,071	20,071	20,071	20,071	20,071		20,071	20,071
Repack Gland, Gate Valve, 2-3"	73				63					13						73				63					13
Replace Circulation Pump, 5 HP, Chiller & Condenser Water								4,075																	
Maintain Condenser, Air-Cooled, 1 Ton	158	158	158	158	158	158	158		158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158
Replace Condenser, Air-Cooled, 1 Ton								3,308																	
Maintain Flow Control Valve & Actuator, 4"	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Valve Actuator, 4"																									
Replace Flow Control Valve, Motorized, 4"				3,456																					
Maintain Flow Control Valve & Actuator, 6"	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Valve Actuator, 6"																									
Replace Flow Control Valve, Motorized, 6"				5,055																					
Replace Pipe & Fittings, 6" Steel (20% of Pipe)																									
Replace Valve Actuator, 12"																									
Replace Flow Control Valve, Motorized, 12"				23,367																					
Replace 10' Section, Pipe & Fittings, 4" Steel				77							62					77							62		
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel												29						37							
Replace Pipe & Fittings, 4" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel												40						33							
Replace 10' Section, Pipe & Fittings, 6" Steel				64							80					64							80		
Replace 10' Section, Pipe & Fittings, 12" Steel				159							190					159							190		
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel												41						32							
Maintain Flow Control Valve & Actuator, 12"	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Pipe & Fittings, 12" Steel (20% of Pipe)																									
D40 Fire Protection																									
Replace Fire Alarm Control Panel			3,726															3,726							
Repair Fire Alarm Control Panel								161					161										161		
Inspect & Test Fire Alarm Control Panel	193	193		193	193	193	193	193	193	193	193	193	193	193	193	193	193		193	193	193	193	193	193	193
D50 Electrical																									
Repair Secondary Transformer, Dry, 112-1/2 kVA			327																				327		
Replace Ballast & Lamp, HP Sodium Lighting Fixture, 250 w													780												

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Fluorescent Lighting Fixture, T8, 2-32 w			4,076																				4,076		
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w			12										12					12					12		
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-3													2,601												
Replace Incandescent Lighting Fixture, Basic, 100 w								156																	
Replace Exit Lighting Fixture, w/ Battery																		1,527							
Replace HP Sodium Lighting Fixture, 250 w								2,178																	
Replace Lamp, Exit Lighting Fixture, w/ Battery			318					318					318										318		
Replace Emergency Lighting Pack, 2 Light w/ Battery			8,028																				8,028		
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/ Ba													295												
Maintain Secondary Transformer, Dry, 112-1/2 kVA	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Secondary Transformer, Dry, 112-1/2 kVA								10,333																	
Replace Lamp, Incandescent Lighting Fixture, Basic, 200 w			228										228					228					228		
Replace Public Address Speaker													1,340												
Replace Secondary Transformer, Dry, 15 kVA								4,577																	
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/ B	555				555		555		555		555		555		555		555		555		555				555
Repair Wiring Device, Switch							1,207															1,207			
Inspect & Clean Motor Starter, 5-20 HP, <600 V	60	60	60	60	60	60	60	60		60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Repair Secondary Transformer, Dry, 15 kVA																		327							
Replace Smoke Detector													880												
Repair Smoke Detector			300																				300		
Replace Batteries & Check Operation, Smoke Detector	118	118	118	118	118	118	118	118	118	118	118	118		118	118	118	118	118	118	118	118	118	118	118	118
Maintain Public Address Speaker	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	120	120	120	120	120	120	120	120
Check & Repair Manual Pull Station			64																				64		
Replace Manual Pull Station													151												
Replace Wiring Device, Switch												1,133													
Replace Incandescent Lighting Fixture, Basic, 200 w								2,645																	
Replace Receptacle, 120 V, 15 Amp.																	2,161								
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w			1,142																				1,142		
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 150													457												
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150								231					231					231							
Replace Metal Halide Lighting Fixture, High Bay, 400 w								17,513																	
Replace Ballast, Metal Halide Lighting Fixture, High Bay, 400 w																		8,711							
Replace Lamp, Metal Halide Lighting Fixture, High Bay, 400 w			3,662										3,662					3,662					3,662		
Replace Fire Alarm Horn & Strobe			1,420																				1,420		
Repair Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.			3,008										3,008												
Maintain Motor Control Center w/ Main Breaker, 480 V, 1200 A	136	136	136	136	136	136	136	136	136	136	136	136		136	136	136	136	136	136	136	136	136	136	136	136
Replace Disconnect Switch, 60 Amp.																							1,741		

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Fluorescent Lighting Fixture, T8, 2-32 w																		4,076							
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w								12					12					12							
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-								2,601																	
Replace Incandescent Lighting Fixture, Basic, 100 w			156																				156		
Replace Exit Lighting Fixture, w/ Battery													1,527												
Replace HP Sodium Lighting Fixture, 250 w			2,178																				2,178		
Replace Lamp, Exit Lighting Fixture, w/ Battery			318					318										318					318		
Replace Emergency Lighting Pack, 2 Light w/ Battery																		8,028							
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/								295																	
Maintain Secondary Transformer, Dry, 112-1/2 kVA	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91
Replace Secondary Transformer, Dry, 112-1/2 kVA													10,333												
Replace Lamp, Incandescent Lighting Fixture, Basic, 200 w								228					228					228							
Replace Public Address Speaker			1,340															1,340							
Replace Secondary Transformer, Dry, 15 kVA													4,577												
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/		555		555		555		555		555		555		555		555				555		555		555	
Repair Wiring Device, Switch												1,207													
Inspect & Clean Motor Starter, 5-20 HP, <600 V	60		60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60		60	60	60	60	60
Repair Secondary Transformer, Dry, 15 kVA			327																				327		
Replace Smoke Detector			880															880							
Repair Smoke Detector													300												
Replace Batteries & Check Operation, Smoke Detector	118	118		118	118	118	118	118	118	118	118	118	118	118	118	118	118		118	118	118	118	118	118	118
Maintain Public Address Speaker	120	120		120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	120	120	120
Check & Repair Manual Pull Station													64												
Replace Manual Pull Station			151															151							
Replace Wiring Device, Switch		1,133															1,133								
Replace Incandescent Lighting Fixture, Basic, 200 w			2,645																				2,645		
Replace Receptacle, 120 V, 15 Amp.												2,161													
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w																		1,142							
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 15								457																	
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150			231					231					231										231		
Replace Metal Halide Lighting Fixture, High Bay, 400 w			17,513																				17,513		
Replace Ballast, Metal Halide Lighting Fixture, High Bay, 400													8,711												
Replace Lamp, Metal Halide Lighting Fixture, High Bay, 400 w								3,662					3,662					3,662							
Replace Fire Alarm Horn & Strobe																		1,420							
Repair Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.								3,008										3,008							
Maintain Motor Control Center w/ Main Breaker, 480 V, 1200	136	136	136	136	136	136	136		136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136
Replace Disconnect Switch, 60 Amp.												870													

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Disconnect Switch, 60 Amp.			380				190						380				190								
Maintain Disconnect Switch, 60 Amp.	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	30	90	90
Replace Disconnect Switch, 30 Amp.																									
Repair Disconnect Switch, 30 Amp.								187			187							187			187				
Maintain Motor Control Center w/ Main Breaker, 480 V, 600 Am	136	136	136	136	136	136	136	136	136	136	136	136		136	136	136	136	136	136	136	136	136	136	136	136
Replace Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.																							19,554		
Maintain Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363		363	363
Maintain Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145		145	145
Replace Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.																							15,824		
Repair Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.			5,027										5,027												
Maintain Secondary Transformer, Dry, 15 kVA	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.																							5,004		
Replace Motor Starter, 5-20 HP, <600 V									860																
Maintain Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145		145	145
Maintain Disconnect Switch, 30 Amp.	30	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Maintain Power Panel Board, 208 Y/120 V, 400 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Repair Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.			2,011										2,011												
Repair Motor Control Center w/ Main Breaker, 480 V, 1200 Am			1,050																				1,050		
Repair Power Panel Board, 208 Y/120 V, 400 Amp.							143										143								
Replace Power Panel Board, 208 Y/120 V, 200 Amp.																									
Repair Power Panel Board, 208 Y/120 V, 200 Amp.							285										285								
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
Replace Power Panel Board, 208 Y/120 V, 100 Amp.																									
Repair Power Panel Board, 208 Y/120 V, 100 Amp.							143										143								
Replace Motor Control Center w/ Main Breaker, 480 V, 600 Am													21,413												
Replace Coil, Motor Starter, 5-20 HP, <600 V			264			264						264			264			264			264			264	
Replace Motor Control Center w/ Main Breaker, 480 V, 1200 A													25,425												
Replace Motor Starter, <5HP, <600V									2,108																
Replace Coil, Motor Starter, <5HP, <600V			789			789						789			789			789			789			789	
Inspect & Clean Motor Starter, <5HP, <600V	183	183	183	183	183	183	183	183		183	183	183	183	183	183	183	183	183	183	183	183	183	183	183	183
Replace Power Panel Board, 208 Y/120 V, 400 Amp.																									
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Repair Motor Control Center w/ Main Breaker, 480 V, 600 Amp.			1,050																				1,050		

F10 Special Construction

Inspect 8x6 Dryer Upstream Air Filter	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213
Inspect 8x6 Dryer Burner Gas Valves	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Check 8x6 Dryer 208 VAC MCC	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Disconnect Switch, 60 Amp.		190						380										380				190			
Maintain Disconnect Switch, 60 Amp.	90	90	90	90	90	90	90	90	90	90	90	59	90	90	90	90	90	90	90	90	90	90	90	90	90
Replace Disconnect Switch, 30 Amp.																							437		
Repair Disconnect Switch, 30 Amp.			187			187							187			187									
Maintain Motor Control Center w/ Main Breaker, 480 V, 600 A	136	136	136	136	136	136	136		136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136
Replace Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.																									
Maintain Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363
Maintain Circuit Breaker, Main, 208 Y, 120 V, 400 Amp.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Replace Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.																									
Repair Circuit Breaker, 600 V, 70-100 Amp., 3 Ph.								5,027										5,027							
Maintain Secondary Transformer, Dry, 15 kVA	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91
Replace Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.																									
Replace Motor Starter, 5-20 HP, <600 V		860																		860					
Maintain Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Maintain Disconnect Switch, 30 Amp.	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	30	60	60
Maintain Power Panel Board, 208 Y/120 V, 400 Amp.	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Repair Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.								2,011										2,011							
Repair Motor Control Center w/ Main Breaker, 480 V, 1200 A																		1,050							
Repair Power Panel Board, 208 Y/120 V, 400 Amp.												143										143			
Replace Power Panel Board, 208 Y/120 V, 200 Amp.		13,063																							
Repair Power Panel Board, 208 Y/120 V, 200 Amp.												285										285			
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	181		181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
Replace Power Panel Board, 208 Y/120 V, 100 Amp.		4,582																							
Repair Power Panel Board, 208 Y/120 V, 100 Amp.												143										143			
Replace Motor Control Center w/ Main Breaker, 480 V, 600 A								21,413																	
Replace Coil, Motor Starter, 5-20 HP, <600 V					264			264			264			264			264						264		
Replace Motor Control Center w/ Main Breaker, 480 V, 1200 A								25,425																	
Replace Motor Starter, <5HP, <600V		2,108																		2,108					
Replace Coil, Motor Starter, <5HP, <600V					789			789			789			789			789						789		
Inspect & Clean Motor Starter, <5HP, <600V	183		183	183	183	183	183	183	183	183	183	183	183	183	183	183	183	183	183		183	183	183	183	183
Replace Power Panel Board, 208 Y/120 V, 400 Amp.		8,240																							
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Repair Motor Control Center w/ Main Breaker, 480 V, 600 Am																		1,050							

F10 Special Construction

Inspect 8x6 Dryer Upstream Air Filter	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213	4,213
Inspect 8x6 Dryer Burner Gas Valves	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Check 8x6 Dryer 208 VAC MCC	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449

Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Service 8x6 Dryer #3 CA Blower Motor Disc Panel	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Calibrate 8x6 Dryer 3 Year	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Shutdown 8x6 Dryer Hardwire	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Dryer Axial Blower Panel	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617
Perform 8x6 Thermography Bldg 57	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698
Service 8x6 Dryer #2 CA Blower Motor Disc Panel	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Dryer NG Main Gas Valve	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Service 8x6 Dryer Return Pump/Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Dryer Sliding Door	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer DPU/Interconnect Cabinet	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994
Service 8x6 Main Gas Regulating Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Dryer #1 CA Blower Motor Disc Panel	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Dryer Combustion Air Blower Motor	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Return/Supply Valve Bldg 57	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer Axial Blower Fan Assembly	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Inspect 8x6 Dryer Coil Trap	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer CW Drain Valve 1	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Inspect 8x6 Dryer CW Drain Valve 2	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Replace 9x15 Air Dryer Dessicant																		36,856							
Inspection 8x6 Air Dryer	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Dryer Makeup Air Vents	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Dryer Compressor Plenum Vent Fan	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Dryer Cross-Over Valve	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Dryer CW Cross-Over Valve	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Dryer Damper Door	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Dryer Exhaust Fans	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Dryer Gas Strainer	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer Downstream Filter	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404

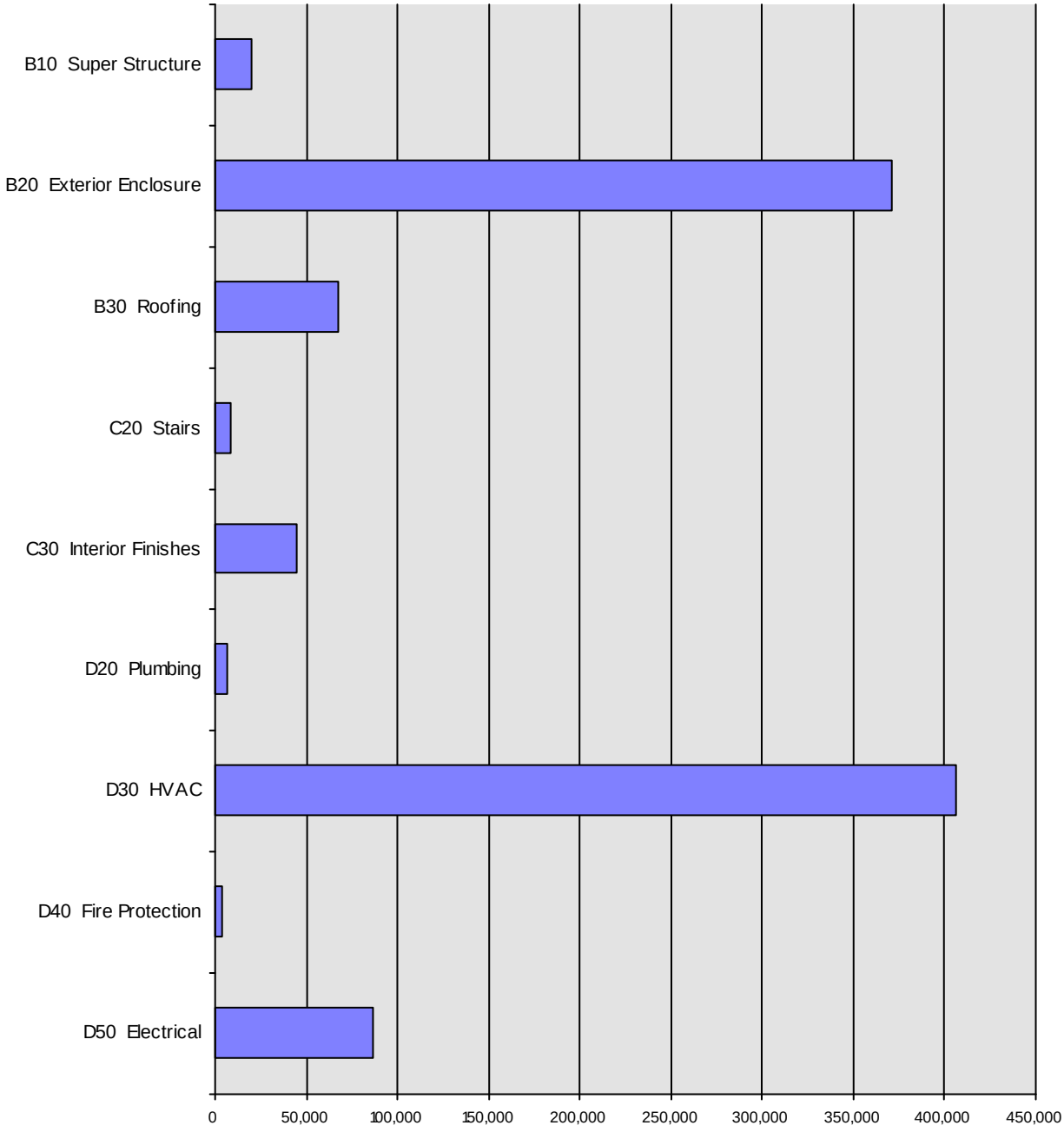
Building: SWT Air Dryer Building **Facility:** Glenn Research Center

Building Num: 0057 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Service 8x6 Dryer #3 CA Blower Motor Disc Panel	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Calibrate 8x6 Dryer 3 Year	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Shutdown 8x6 Dryer Hardwire	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Inspect 8x6 Dryer Axial Blower Panel	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617	5,617
Perform 8x6 Thermography Bldg 57	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698	8,698
Service 8x6 Dryer #2 CA Blower Motor Disc Panel	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Dryer NG Main Gas Valve	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Service 8x6 Dryer Return Pump/Motor	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Dryer Sliding Door	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer DPU/Interconnect Cabinet	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994	1,994
Service 8x6 Main Gas Regulating Valve	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Dryer #1 CA Blower Motor Disc Panel	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Service 8x6 Dryer Combustion Air Blower Motor	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Return/Supply Valve Bldg 57	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer Axial Blower Fan Assembly	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Inspect 8x6 Dryer Coil Trap	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer CW Drain Valve 1	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Inspect 8x6 Dryer CW Drain Valve 2	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702	702
Replace 9x15 Air Dryer Dessicant													36,856												
Inspection 8x6 Air Dryer	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Dryer Makeup Air Vents	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106	2,106
Service 8x6 Dryer Compressor Plenum Vent Fan	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Dryer Cross-Over Valve	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Dryer CW Cross-Over Valve	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
Service 8x6 Dryer Damper Door	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Service 8x6 Dryer Exhaust Fans	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Service 8x6 Dryer Gas Strainer	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Inspect 8x6 Dryer Downstream Filter	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404

Building Deferred Maintenance by System Chart

Building: SWT Air Dryer Building **Building Num:** 0057



All costs expressed in ($) 2012. Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral and is included in Total Deferred Maintenance.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: SWT Air Dryer Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $19,746,852
per SF: $365

Building Type: Central Plant, Chilled Water
Building Gsft: 54,111
Building Number: 0057

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1949	29	Replace Dryer Door	$370,805	$0	$370,805
1949	24	Replace Gas Burner, 8,000 Mbh	$324,717	$0	$324,717
1949	24	Replace Metal Roof	$64,501	$0	$64,501
1949	24	Replace Steel Perforated Flooring, Raised	$40,064	$0	$40,064
1990	18	Replace Pressure Reducer Valve, 2"	$34,862	$0	$34,862
1985	8	Replace Motor Control Center w/ Main Breaker, 480 V, 1200 Amp.	$25,425	$0	$25,425
1985	8	Replace Motor Control Center w/ Main Breaker, 480 V, 600 Amp.	$21,413	$0	$21,413
1992	5	Replace Air Handler, Multizone, 6,500 Cfm	$20,165	$0	$20,165
1949	34	Replace Power Panel Board, 208 Y/120 V, 200 Amp.	$13,063	$0	$13,063
1949	34	Replace Metal Decking	$11,145	$0	$11,145
1949	34	Replace Power Panel Board, 208 Y/120 V, 400 Amp.	$8,240	$0	$8,240
2000	1	Replace Condensate Receiver Station, 10-15 Gal.	$6,956	$0	$6,956
1949	52	Replace Condensate Receiver Station, 10-15 Gal.	$6,956	$0	$6,956
1949	24	Replace Steel Roof Access Ladder	$5,931	$0	$5,931
1949	14	Replace Metal, Painted, Exterior Stairs	$5,063	$0	$5,063
1949	34	Replace Power Panel Board, 208 Y/120 V, 100 Amp.	$4,582	$0	$4,582
1949	32	Replace Circulation Pump, 5 HP, Chiller & Condenser Water	$4,075	$0	$4,075
1995	3	Replace Fire Alarm Control Panel	$3,726	$0	$3,726
1949	46	Replace Vinyl Tile Flooring	$2,793	$0	$2,793
1949	49	Replace Gate Valve, 6"	$2,685	$0	$2,685
1949	44	Replace Aluminum Gutter, Downspouts, Fittings	$2,683	$0	$2,683
1960	33	Replace Incandescent Lighting Fixture, Basic, 200 w	$2,645	$0	$2,645
1949	44	Replace Water Storage Tank, 250 Gal.	$2,602	$0	$2,602
1949	24	Replace Steel Roof Access Ladder	$2,542	$0	$2,542
1949	44	Replace Receptacle, 120 V, 15 Amp.	$2,161	$0	$2,161
1949	46	Replace Motor Starter, <5HP, <600V	$2,108	$0	$2,108
1949	34	Replace Metal, Painted, Exterior Railing	$2,015	$0	$2,015
1949	29	Replace Acoustical Tile, Dropped Ceiling	$2,002	$0	$2,002
1949	24	Replace Floor Drain	$1,965	$0	$1,965
1980	16	Replace Gate Valve, 4"	$1,873	$0	$1,873
1949	14	Replace Metal, Painted, Interior Railing	$1,696	$0	$1,696
1990	3	Replace Exit Lighting Fixture, w/ Battery	$1,527	$0	$1,527
1995	3	Replace Public Address Speaker	$1,340	$0	$1,340

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: SWT Air Dryer Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $19,746,852
per SF: $365

Building Type: Central Plant, Chilled Water
Building Gsft: 54,111
Building Number: 0057

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1949	49	Replace Wiring Device, Switch	$1,133	$0	$1,133
1949	24	Replace Floor Drain	$983	$0	$983
1995	3	Replace Smoke Detector	$880	$0	$880
1949	14	Replace Disconnect Switch, 60 Amp.	$870	$0	$870
1949	46	Replace Motor Starter, 5-20 HP, <600 V	$860	$0	$860
1949	49	Replace Valve, Non-Drain, 16"	$774	$0	$774
1949	32	Replace Unit Heater, 12 Mbh	$761	$0	$761
1980	8	Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pipe)	$760	$0	$760
1980	16	Replace Ball Valve, 2"	$615	$0	$615
1980	16	Replace Gate Valve, 2-3"	$581	$0	$581
1949	29	Replace Radiator, Wall, Cast Iron	$454	$0	$454
1992	11	Replace Thermostat	$404	$0	$404
1949	56	Replace Steam Trap, F&T, 1"	$369	$0	$369
1960	33	Replace Incandescent Lighting Fixture, Basic, 100 w	$156	$0	$156
1995	3	Replace Manual Pull Station	$151	$0	$151
1980	8	Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insulation	$144	$0	$144
1949	49	Replace Gate Valve, 2-3"	$117	$0	$117
		Total	**$1,014,338**	**$0**	**$1,014,338**

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Operations Task Details

Whitestone Research

Building: SWT Air Dryer Building **Year Built:** 1949 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0057

City: Cleveland, OH **Replacement Value:** $19,746,852 **per SF:** $365 **Building Gsft:** 54,111

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Custodial		**Level of Service: Low**			
Central Utility	30302	Damp Mop Hard Floors with 24 oz. Mop Head Using Double Bucket & Wringer	$1,466	$238	$1,705
Central Utility	30302	Empty Trash; Wipe Clean & Re-line Basket	$401	$65	$466
Mechanical/Equipment	16774	Sweep Hard Floor with 48" Push Broom	$346	$56	$402
Mechanical/Equipment	16774	Empty Trash; Wipe Clean & Re-line Basket	$222	$36	$258
Other	5411	None	$0	$0	$0
Computer Room	1082	Damp Wipe Surfaces with Trigger Sprayer & Cloth	$183	$30	$213
Computer Room	1082	Wet Mop & Rinse Hard Floor with 32 oz. Mop Using Double Bucket & Wringer	$143	$23	$166
Computer Room	1082	Sweep Hard Floor with 36" Push Broom	$105	$17	$122
Computer Room	1082	Empty Trash; Wipe Clean & Re-line Basket	$62	$10	$72
Restroom	541	Service Restroom: Empty Trash, Clean & Disinfect Fixtures, Wipe Mirrors, Replace Supplies, Wet	$1,302	$212	$1,513
Restroom	541	Service Restroom: Empty Trash, Replace Supplies & Touch Up as Needed	$200	$32	$232
Total:			**$4,429**	**$720**	**$5,149**
Operation: Grounds		**Level of Service: Medium**			
Grounds, Improved	32466	Mow Turfgrass with 21" Power Mower	$1,894	$788	$2,681
Grounds, Improved	32466	Aerate Improved Grounds	$1,726	$718	$2,444
Grounds, Improved	32466	Clear Shrubs	$1,153	$480	$1,633
Grounds, Improved	32466	Overseed, Improved Grounds	$863	$359	$1,222
Grounds, Improved	32466	Edge Clean & Trim Walks with Gas Powered Edger	$725	$302	$1,027
Grounds, Improved	32466	Vacuum with 30" Billy Goat	$577	$240	$816
Grounds, Improved	32466	Clear Crabgrass	$432	$180	$611
Grounds, Improved	32466	Clear Weeds with 15" Boom, Improved Grounds	$230	$96	$325
Grounds, Improved	32466	Fertilize Improved Grounds	$173	$72	$244
Grounds, Improved	32466	Trim Around Raised Objects with String Edger	$149	$62	$210
Grounds, Improved	32466	Sweep with 30" Power Rake	$114	$47	$161
Grounds, Improved	32466	Fertilize Using Power Take Off Broadcast	$0	$0	$0
Total:			**$8,034**	**$3,342**	**$11,377**

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Pest Control		**Level of Service: Medium**			
Pest Controlled	54111	Install, or Check and Re-Bait 5 Rodent Boxes	$1,472	$612	$2,085
Pest Controlled	54111	Perform Crawling Insect Abatement	$1,105	$460	$1,565
Pest Controlled	54111	Inspect Building for Pests	$615	$0	$615
Total:			**$3,192**	**$1,072**	**$4,264**
Operation: Road Clearance		**Level of Service: Medium**			
Pavement NASA	43288	Plow Paved Area	$3,330	$1,004	$4,334
Total:			**$3,330**	**$1,004**	**$4,334**
Operation: Security		**Level of Service: Medium**			
Secured Area	54111	Patrol Building Perimeter	$9,149	$1,487	$10,636
Secured Area	54111	Guard Lobby/Parking	$0	$0	$0
Total:			**$9,149**	**$1,487**	**$10,636**

Building Operations Service Details

Whitestone Research

Building: SWT Air Dryer Building **Year Built:** 1949 **FTEs:** 57 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0057

City: Cleveland, OH **Replacement Value:** $19,746,852 **per SF:** $365 **Building Gsft:** 54,111

	Service*	Quantity	Rate	Cost
Operation: Security	**Level of Service: Medium**			
	Intrusion Detection Systems	2	$4,986	$9,972
	System Monitoring	2	$3,615	$7,230
	Access Control	2	$2,690	$5,380
	Total:			**$22,582**
Operation: Telecom	**Level of Service: High**			
	Local Telephone	57	$468	$26,676
	Data	57	$3,588	$13,703
	Long Distance Telephone	57	$192	$10,944
	Total:			**$51,323**

All costs expressed in ($) 2012.

19-Dec-14

* Secutity may be composed of service and task based cost. See Building Operations Task Details for Security Tasks.

Building Operations Management Details

Whitestone Research

Building: SWT Air Dryer Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1949
Original Cost: $1
Replacement Value: $19,746,852 **per SF:** $365

Building Type: Central Plant, Chilled Wate
Building Num: 0057
Building Gsft: 54,111

	Service	Demand	UM	PRV	Cost
Operation: Management	**Level of Service: Low**				
	Management	0.3%	PRV	$19,746,852	$49,367
	Total:				**$49,367**

Average M&R Costs

Whitestone Research

	Models Preparation Building	**GSFT:**	2,705
Building Number:	0061	**PRV:**	$2,087,887
Facility:	Glenn Research Center	**Built Date:**	1993
City:	Cleveland, OH		

M&R Average Annual Cost Forecasts

	Current Year	5 Year	20 Year	50 Year
PM & Minor Repair:	$16,239	$10,024	$9,663	$9,774
Unscheduled Maintenance:	$13,295	$6,436	$5,471	$5,487
Renewal & Replacement:	$46,176	$22,221	$23,902	$20,943
Total M&R Costs:	$75,710	$38,681	$39,036	$36,204
Per GSFT:	$27.99	$14.30	$14.43	$13.38
As % of PRV:	3.63%	1.85%	1.87%	1.73%

All costs expressed in ($) 2012.

Based on a 50-Year Forecast.

Building Component List

Whitestone Research

Building: Models Preparation Building **Year Built:** 1993 **Building Type:** Maintenance Shop

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0061

City: Cleveland, OH **Replacement Value:** $2,087,887 **per SF:** $772 **Building Gsft:** 2,705

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
B1020		Steel Roof Access Ladder	1993	40 Ln Ft		
B2010		Aluminum Louver, 1st Floor	1993	2 Each		
B2010		Concrete Block, Exterior, 1st Floor	1993	1500 Sq Ft		
B2010		Concrete Block, Exterior, 2nd Floor	1993	1350 Sq Ft		
B2020		Glass Block Window, 1st Floor	1993	50 Sq Ft		
B2020		Glass Block Window, 2nd Floor	1993	135 Sq Ft		
B2030		Steel, 10'x8', Painted, Overhead Coiling Door, Motorized	1993	1 Each		
B2030		Steel, 14'x10', Painted, Overhead Coiling Door, Motorized	1993	1 Each		
B2030		Steel, Painted, Exterior Door	1993	3 Each		
B3010		Aluminum Gutter, Downspouts, Fittings	1993	0.05 K Ln Ft		
B3010		Built-up Roof	1993	2410 Sq Ft		
B3010		Metal Roof	1993	200 Sq Ft		
C1020		Steel, 10'x8', Painted, Overhead Coiling Door, Motorized	1993	2 Each		
C1020		Steel, Painted, Interior Door	1993	3 Each		
C2010		Metal, Painted, Interior Railing	1993	20 Ln Ft		
C3010		Concrete Block, Painted, Interior Wall Finish	1993	4640 Sq Ft		
C3020		Concrete Flooring	1993	194 Sq Ft		
C3020		Concrete, Painted Flooring	1993	2305 Sq Ft		
C3020		Plywood Flooring	1993	103 Sq Ft		
C3020		Vinyl Sheet Flooring	1993	103 Sq Ft		
C3030		Acoustical Tile, Dropped Ceiling	1993	103 Sq Ft		
C3030		Metal, Painted Ceiling	1993	2499 Sq Ft		
D1010		Bridge Crane, Overhead, 3 Ton	1993	1 Each		2.5 Ton
D2010		Drinking Fountain, Refrigerated	2012	1 Each		
D2010		Emergency Eye Wash	2012	1 Each		
D2010		Flush Tank Water Closet, One Piece	1993	1 Each		
D2010		Lavatory, Vitreous China	1993	1 Each		
D2010		Service Sink, Iron, Enamel	1993	1 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D2020		Gate Valve, 2-3"	1993	7 Each		
D2020		Gate Valve, 4"	1993	1 Each		
D2020		Pipe & Fittings, 2" Steel	1993	0.2 K Ln Ft		
D2020		Pipe & Fittings, 3/4" Copper, Cold Water	1993	0.1 K Ln Ft		
D2020		Pipe & Fittings, 3/4" Copper, Hot Water	1993	0.1 K Ln Ft		
D2020		Pipe & Fittings, 4" Steel	1993	0.15 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Cold Water	1993	0.1 K Ln Ft		
D2020		Pipe Insulation, Fiberglass, Hot Water	1993	0.1 K Ln Ft		
D2020		Water Heater, Electric, 30 Gal.	2000	1 Each		
D2030		Floor Drain	1993	4 Each		
D2030		Pipe & Fittings, 3" Cast Iron	1993	0.05 K Ln Ft		
D2030		Pipe & Fittings, 4" Cast Iron	1993	0.225 K Ln Ft		
D2040		Pipe & Fittings, 3" Cast Iron	1993	0.25 K Ln Ft		
D2040		Roof Drain, 4-6"	1993	4 Each		
D3010		Hydraulic Power Unit, 10 Gal.	2010	2 Each		
D3010		Pipe & Fittings, 1" Copper, Fuel Oil	1993	0.4 K Ln Ft		hydraulic
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	1993	0.4 K Ln Ft		hydraulic
D3020		Flow Control Valve, Motorized, 2"	1993	1 Each		
D3020		Gate Valve, 2-3"	1993	2 Each		
D3020		Gate Valve, 2-3"	1993	2 Each		
D3020		Pipe & Fittings, 2" Steel	1993	0.35 K Ln Ft		
D3020		Pipe Insulation, Fiberglass, Heating Water/Steam	1993	0.35 K Ln Ft		
D3020		Steam Trap, F&T, 1"	1993	2 Each		
D3030		Flow Control Valve, Motorized, 2"	1993	1 Each		
D3030		Pipe & Fittings, 2" Steel	1993	0.35 K Ln Ft		
D3030		Pipe Insulation, Fiberglass, Chilled Water	1993	0.35 K Ln Ft		
D3040		Air Handler, Single Zone, 2,500 Cfm	1993	1 Each		
D3040		Exhaust Fan, Centrifugal, 2,000 Cfm	1993	1 Each		
D3040		Steel Damper, Motorized, w/ Actuator	1993	1 Each		
D3050		Finned Radiator, 10 ft.	1993	2 Each		5ft
D3050		Unit Heater, 12 Mbh	1993	2 Each		
D3050		Unit Heater, 480v, 5kW	1993	1 Each		
D3060		Direct Digital Controls, System Points	2010	47 Each		
D3060		Thermostat	1993	3 Each		
D4030		Fire Extinguisher	2006	3 Each		
D5010		Disconnect Switch, 30 Amp.	1993	6 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D5010		Disconnect Switch, 60 Amp.	1993	2 Each		
D5010	PXR0001	Power Panel Board, 208 Y/120 V, 100 Amp.	1993	1 Each		
D5010	PXR0802	Power Panel Board, 208 Y/120 V, 100 Amp.	1993	1 Each		
D5010	F0302	Power Panel Board, 480 V, 200 Amp.	1993	1 Each		
D5010	PXR08	Secondary Transformer, Dry, 45 kVA	1993	1 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1993	1 Each		
D5020		Exit Lighting Fixture, w/ Battery	1993	2 Each		
D5020		Fluorescent Lighting Fixture, T12, 4-60 w	1993	42 Each		
D5020		Incandescent Lighting Fixture, Basic, 100 w	1993	2 Each		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150 w	1993	3 Each		
D5020		Receptacle, 208 V, 3 phase	1993	10 Each		
D5020		Receptacle, 120 V, 15 Amp.	1993	30 Each		
D5020		Receptacle, 120 V, 20 Amp.	1993	5 Each		
D5020		Wiring Device, Switch	1993	16 Each		
D5030		Card Reader w/ Keypad	2006	4 Each		
D5030		Electric Lock	2006	4 Each		
D5030		Fire Alarm Horn & Strobe	1993	3 Each		
D5030		Heat Detector	1993	1 Each		
D5030		Intrusion Detection Motion Detector, Interior	2006	2 Each		
D5030		Manual Pull Station	1993	1 Each		
D5030		Motion Detector	2006	4 Each		
D5030		Public Address Speaker	1993	3 Each		
G3090		Nitrogen Storage Tank, 500 Gal.	1959	8 Each	Certified until 2016	Exterior

Building Extended Component List with Remaining Service Life

Whitestone Research 04-Jun-15

Building: Models Preparation Building **Year Built:** 1993 **Building Type:** Maintenance Shop

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0061

City: Cleveland, OH **Replacement Value:** $2,087,887 **per SF:** $772 **Building Gsft:** 2,705

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
B1020		Steel Roof Access Ladder	1993	19	40 Ln Ft					
B2010		Aluminum Louver, 1st Floor	1993	39	2 Each					
B2010		Concrete Block, Exterior, 1st Floor	1993	79	1500 Sq Ft					
B2010		Concrete Block, Exterior, 2nd Floor	1993	79	1350 Sq Ft					
B2020		Glass Block Window, 1st Floor	1993	54	50 Sq Ft					
B2020		Glass Block Window, 2nd Floor	1993	54	135 Sq Ft					
B2030		Steel, 10'x8', Painted, Overhead Coiling Door,	1993	14	1 Each					
B2030		Steel, 14'x10', Painted, Overhead Coiling Door	1993	14	1 Each					
B2030		Steel, Painted, Exterior Door	1993	54	3 Each					
B3010		Aluminum Gutter, Downspouts, Fittings	1993	-1	0.05 K Ln Ft					
B3010		Built-up Roof	1993	9	2410 Sq Ft					
B3010		Metal Roof	1993	19	200 Sq Ft					
C1020		Steel, 10'x8', Painted, Overhead Coiling Door,	1993	14	2 Each					
C1020		Steel, Painted, Interior Door	1993	54	3 Each					
C2010		Metal, Painted, Interior Railing	1993	29	20 Ln Ft					
C3010		Concrete Block, Painted, Interior Wall Finish	1993	54	4640 Sq Ft					
C3020		Concrete Flooring	1993	54	194 Sq Ft					
C3020		Concrete, Painted Flooring	1993	54	2305 Sq Ft					
C3020		Plywood Flooring	1993	19	103 Sq Ft					
C3020		Vinyl Sheet Flooring	1993	-3	103 Sq Ft	$759	$0	$759		
C3030		Acoustical Tile, Dropped Ceiling	1993	14	103 Sq Ft					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
C3030		Metal, Painted Ceiling	1993	54	2499 Sq Ft					
D1010		Bridge Crane, Overhead, 3 Ton	1993	4	1 Each					2.5 Ton
D2010		Drinking Fountain, Refrigerated	2012	8	1 Each					
D2010		Emergency Eye Wash	2012	23	1 Each					
D2010		Flush Tank Water Closet, One Piece	1993	14	1 Each					
D2010		Lavatory, Vitreous China	1993	14	1 Each					
D2010		Service Sink, Iron, Enamel	1993	14	1 Each					
D2020		Gate Valve, 2-3"	1993	-4	7 Each	$4,064	$0	$4,064		
D2020		Gate Valve, 4"	1993	-4	1 Each	$1,873	$0	$1,873		
D2020		Pipe & Fittings, 2" Steel	1993	54	0.2 K Ln Ft					
D2020		Pipe & Fittings, 3/4" Copper, Cold Water	1993	4	0.1 K Ln Ft					
D2020		Pipe & Fittings, 3/4" Copper, Hot Water	1993	4	0.1 K Ln Ft					
D2020		Pipe & Fittings, 4" Steel	1993	54	0.15 K Ln Ft					
D2020		Pipe Insulation, Fiberglass, Cold Water	1993	4	0.1 K Ln Ft					
D2020		Pipe Insulation, Fiberglass, Hot Water	1993	4	0.1 K Ln Ft					
D2020		Water Heater, Electric, 30 Gal.	2000	1	1 Each					
D2030		Floor Drain	1993	19	4 Each					
D2030		Pipe & Fittings, 3" Cast Iron	1993	54	0.05 K Ln Ft					
D2030		Pipe & Fittings, 4" Cast Iron	1993	54	0.225 K Ln Ft					
D2040		Pipe & Fittings, 3" Cast Iron	1993	54	0.25 K Ln Ft					
D2040		Roof Drain, 4-6"	1993	19	4 Each					
D3010		Hydraulic Power Unit, 10 Gal.	2010	16	2 Each					
D3010		Pipe & Fittings, 1" Copper, Fuel Oil	1993	4	0.4 K Ln Ft					hydraulic
D3010		Pipe & Fittings, 2" Copper, Fuel Oil	1993	4	0.4 K Ln Ft					hydraulic
D3020		Flow Control Valve, Motorized, 2"	1993	-4	1 Each	$1,665	$0	$1,665		
D3020		Gate Valve, 2-3"	1993	-6	2 Each	$1,162	$0	$1,162		
D3020		Gate Valve, 2-3"	1993	-6	2 Each	$1,162	$0	$1,162		
D3020		Pipe & Fittings, 2" Steel	1993	54	0.35 K Ln Ft					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3020		Pipe Insulation, Fiberglass, Heating Water/Ste	1993	4	0.35 K Ln Ft					
D3020		Steam Trap, F&T, 1"	1993	-13	2 Each	$739	$0	$739		
D3030		Flow Control Valve, Motorized, 2"	1993	15	1 Each					
D3030		Pipe & Fittings, 2" Steel	1993	54	0.35 K Ln Ft					
D3030		Pipe Insulation, Fiberglass, Chilled Water	1993	4	0.35 K Ln Ft					
D3040		Air Handler, Single Zone, 2,500 Cfm	1993	-5	1 Each	$9,474	$0	$9,474		
D3040		Exhaust Fan, Centrifugal, 2,000 Cfm	1993	-6	1 Each	$2,041	$0	$2,041		
D3040		Steel Damper, Motorized, w/ Actuator	1993	-1	1 Each					
D3050		Finned Radiator, 10 ft.	1993	-6	2 Each	$3,002	$0	$3,002		5ft
D3050		Unit Heater, 12 Mbh	1993	11	2 Each					
D3050		Unit Heater, 480v, 5kW	1993	11	1 Each					
D3060		Direct Digital Controls, System Points	2010	6	47 Each					
D3060		Thermostat	1993	-11	3 Each	$1,211	$0	$1,211		
D4030		Fire Extinguisher	2006	4	3 Each					
D5010		Disconnect Switch, 30 Amp.	1993	29	6 Each					
D5010		Disconnect Switch, 60 Amp.	1993	29	2 Each					
D5010	PXR0802	Power Panel Board, 208 Y/120 V, 100 Amp.	1993	9	1 Each					
D5010	PXR0001	Power Panel Board, 208 Y/120 V, 100 Amp.	1993	9	1 Each					
D5010	F0302	Power Panel Board, 480 V, 200 Amp.	1993	9	1 Each					
D5010	PXR08	Secondary Transformer, Dry, 45 kVA	1993	9	1 Each					
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1993	-1	1 Each					
D5020		Exit Lighting Fixture, w/ Battery	1993	-1	2 Each					
D5020		Fluorescent Lighting Fixture, T12, 4-60 w	1993	-1	42 Each					
D5020		Incandescent Lighting Fixture, Basic, 100 w	1993	-1	2 Each					
D5020		Metal Halide Lighting Fixture, Wall Mount, 150	1993	-1	3 Each					
D5020		Receptacle, 208 V, 3 phase	1993	-1	10 Each					
D5020		Receptacle, 120 V, 15 Amp.	1993	-1	30 Each					
D5020		Receptacle, 120 V, 20 Amp.	1993	-1	5 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5020		Wiring Device, Switch	1993	-6	16 Each	$725	$0	$725		
D5030		Card Reader w/ Keypad	2006	2	4 Each					
D5030		Electric Lock	2006	2	4 Each					
D5030		Fire Alarm Horn & Strobe	1993	-1	3 Each					
D5030		Heat Detector	1993	-6	1 Each	$183	$0	$183		
D5030		Intrusion Detection Motion Detector, Interior	2006	2	2 Each					
D5030		Manual Pull Station	1993	-6	1 Each	$151	$0	$151		
D5030		Motion Detector	2006	2	4 Each					
D5030		Public Address Speaker	1993	-6	3 Each	$1,005	$0	$1,005		
G3090		Nitrogen Storage Tank, 500 Gal.	1959	1	8 Each				Certified until 2016	Exterior

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Forecast Year: 2013

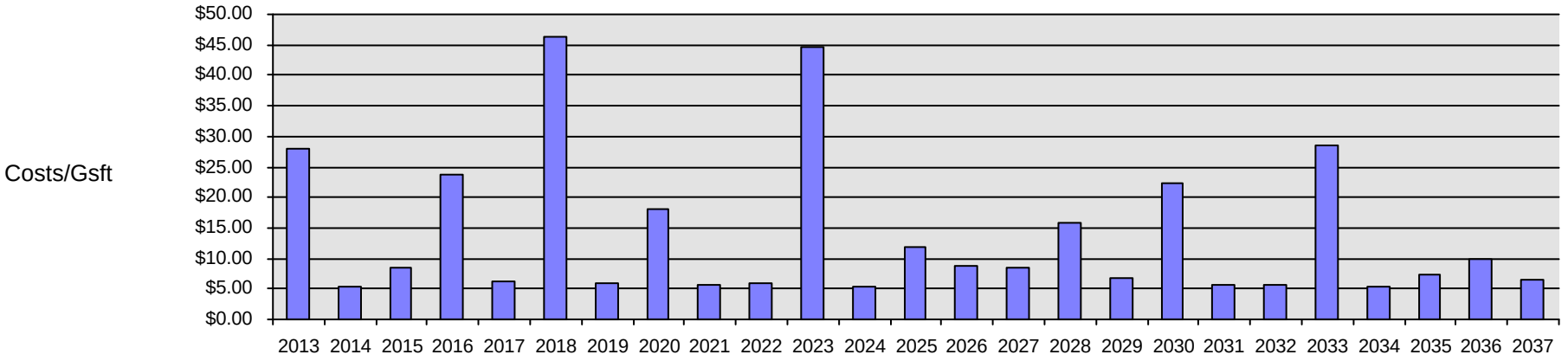
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Models Preparation Building **Facility:** Glenn Research Center **City:** Cleveland, OH

2705

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
A10 Foundations																									
A20 Basement Construction																									
B10 Super Structure											0.36										1.25				
B20 Exterior Enclosure	6.91	0.20	0.20	0.20	0.20	5.06	0.20	0.20	0.20	0.20	7.14	0.20	0.20	0.20	0.20	5.07	0.20	0.20	0.20	0.20	6.26	0.20	0.20	0.20	0.20
B30 Roofing	0.33	0.10	0.10	0.10	0.10	0.18	0.10	0.10	0.10	0.10	9.97	0.10	0.10	0.10	0.10	0.18	0.10	0.10	0.10	0.10	1.10	0.10	0.10	0.10	0.10
C10 Interior Construction	1.33	0.21	0.21	0.21	0.24	0.28	0.21	0.21	0.24	0.21	1.30	0.21	0.24	0.21	0.21	3.68	0.24	0.21	0.21	0.21	0.68	0.21	0.21	0.21	0.24
C20 Stairs	0.01				0.01				0.01		0.01		0.01				0.01				0.01				0.01
C30 Interior Finishes	4.56					7.92		0.01			4.76					0.12	0.28				4.67				0.00
D10 Conveying	0.50	0.50	0.50	0.50	0.50	24.45	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
D20 Plumbing	0.56	0.40	0.86	0.30	0.70	0.90	0.33	0.30	0.40	0.76	0.53	0.36	0.54	0.30	2.58	1.28	0.51	0.89	0.27	0.73	1.43	0.36	0.47	0.45	0.73
D30 HVAC	4.63	1.89	4.42	2.28	2.27	4.78	2.59	14.65	2.21	2.28	5.81	1.89	8.27	1.89	2.76	2.53	2.85	18.12	2.30	1.99	3.35	1.89	3.66	3.04	2.65
D40 Fire Protection				0.05		0.35					0.05					0.05		0.35					0.05		
D50 Electrical	8.00	0.85	0.89	4.34	0.89	1.10	0.89	0.85	0.89	0.85	13.10	0.85	0.89	4.34	0.89	1.10	0.89	0.85	0.89	0.85	8.00	0.85	0.89	4.34	0.89
E10 Equipment																									
E20 Furnishings																									
F10 Special Construction																									
F20 Selective Bldg Demolition																									
G10 Site Preparation																									
G20 Site Improvements																									
G30 Site Mechanical Utilities	1.16	1.16	1.16	15.80	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
G40 Site Electrical Utilities																									
G90 Other Site Construction																									
Total	**27.99**	**5.32**	**8.34**	**23.78**	**6.07**	**46.20**	**5.98**	**17.98**	**5.71**	**6.06**	**44.70**	**5.27**	**11.92**	**8.70**	**8.40**	**15.68**	**6.75**	**22.39**	**5.63**	**5.74**	**28.43**	**5.27**	**7.25**	**9.99**	**6.49**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 1-25

Based on a 50-Year Forecast.

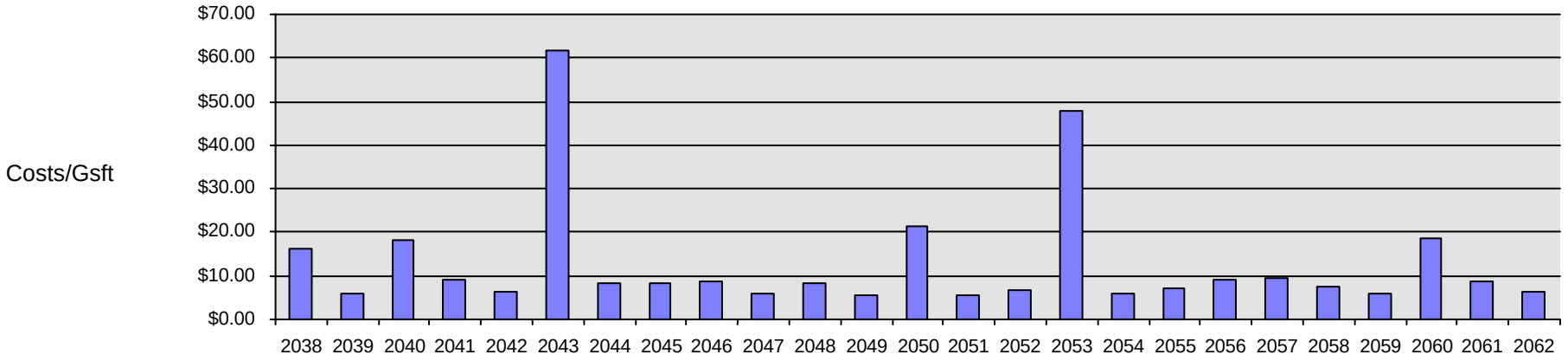
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Models Preparation Building **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0061 **GSFT:** 2705

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2	**Total**
A10 Foundations																										**0.00**
A20 Basement Construction																										**0.00**
B10 Super Structure											0.36															**1.98**
B20 Exterior Enclosure	1.13	0.20	0.20	0.20	0.20	11.07	0.20	0.20	0.20	0.20	0.91	0.20	0.20	0.20	0.20	6.90	0.20	0.20	0.20	0.20	0.91	0.20	0.20	0.20	0.20	**59.18**
B30 Roofing	4.88	0.10	0.10	0.10	0.10	0.18	0.10	0.10	0.10	0.10	0.18	0.10	0.10	0.10	0.10	10.11	0.10	0.10	0.10	0.10	0.18	0.10	0.10	0.10	0.10	**31.45**
C10 Interior Construction	0.93	0.21	0.21	0.24	0.21	0.65	0.21	0.24	0.21	0.21	0.93	0.24	0.21	0.21	0.21	0.68	0.21	0.21	0.21	0.24	0.93	0.21	0.21	0.24	0.21	**20.10**
C20 Stairs	0.01			0.01		0.23				0.01				0.01				0.01			0.01	0.01				**0.39**
C30 Interior Finishes	0.21					12.49			0.00	0.28						4.76		0.00	0.00							**40.08**
D10 Conveying	0.50	0.50	0.50	0.50	0.50	24.45	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	**72.92**
D20 Plumbing	0.58	0.30	0.39	0.43	0.77	1.06	2.67	0.78	0.39	0.28	0.56	0.32	0.36	0.30	1.05	0.52	0.39	0.30	0.38	0.31	0.59	0.36	1.08	2.49	1.10	**34.71**
D30 HVAC	4.92	2.59	14.55	5.40	2.28	5.51	2.44	4.50	1.99	2.30	2.38	2.11	18.12	2.21	2.65	6.32	2.33	3.66	2.28	5.99	1.99	2.59	14.55	3.29	2.38	**224.36**
D40 Fire Protection			0.05		0.35					0.05					0.05		0.35					0.05				**1.82**
D50 Electrical	1.78	0.89	0.85	0.89	0.85	4.96	0.85	0.89	4.34	0.89	1.43	0.89	0.85	0.89	0.85	16.70	0.85	0.89	4.34	0.89	1.10	0.89	0.85	0.89	0.85	**109.56**
E10 Equipment																										**0.00**
E20 Furnishings																										**0.00**
F10 Special Construction																										**0.00**
F20 Selective Bldg Demolition																										**0.00**
G10 Site Preparation																										**0.00**
G20 Site Improvements																										**0.00**
G30 Site Mechanical Utilities	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	**72.67**
G40 Site Electrical Utilities																										**0.00**
G90 Other Site Construction																										**0.00**
Total	**16.09**	**5.95**	**18.01**	**8.93**	**6.42**	**61.77**	**8.13**	**8.38**	**8.89**	**5.99**	**8.41**	**5.52**	**21.50**	**5.58**	**6.77**	**47.66**	**6.09**	**7.03**	**9.17**	**9.40**	**7.37**	**6.07**	**18.65**	**8.88**	**6.50**	**669.23**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 26-50

Based on a 50-Year Forecast.

M&R Costs by Task

Whitestone Research

04-Jun-15

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
B10 Super Structure																									
Replace Steel Roof Access Ladder																					3,389				
Repair Steel Roof Access Ladder											987														
B20 Exterior Enclosure																									
Repair Steel, 10'x8', Painted, Overhead Coiling Door, Motorize	700										700														
Repair Steel, Painted, Exterior Door											611														
Refinish Steel, Painted, Exterior Door	95										95										95				
Replace Steel, Painted, Exterior Door Locks	1,048										1,048										1,048				
Maintain Steel, Painted, Exterior Door Locks	69					69					69					69					69				
Finish Replaced Steel, 14'x10', Painted, Overhead Coiling Door																177									
Finish Replaced Steel, 10'x8', Painted, Overhead Coiling Door,																177									
Replace Steel, 14'x10', Painted, Overhead Coiling Door, Motori																8,487									
Replace Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz																4,707									
Refinish Steel, 14'x10', Painted, Overhead Coiling Door, Motori	177										177														
Repair Steel, 14'x10', Painted, Overhead Coiling Door, Motoriz	700										700														
Clean & Seal Concrete Block, Exterior, 2nd Floor	3,716										3,716										3,716				
Refinish Aluminum Louver, 1st Floor	125										125										125				
Replace Aluminum Louver, 1st Floor																									
Clean & Seal Concrete Block, Exterior, 1st Floor	2,859										2,859										2,859				
Refinish Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz	177										177														
Repoint (50% surface) Concrete Block, Exterior, 1st Floor						5,851																			
Maintain Steel, 14'x10', Painted, Overhead Coiling Door, Motori	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105		105	105	105	105	105	105	105	105	105
Repair Concrete Block, Exterior, 2nd Floor (2% of Walls)						549																			
Repoint (50% surface) Concrete Block, Exterior, 2nd Floor						6,021																			
Repair Glass Block Window, 1st Floor (2% of Glass)	37										37										37				
Repair Glass Block Window, 2nd Floor (2% of Glass)	104										104										104				
Maintain Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105		105	105	105	105	105	105	105	105	105
Repair Concrete Block, Exterior, 1st Floor (2% of Walls)						577																			
B30 Roofing																									
Maintain Metal Roof	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22		22	22	22	22
Maintain Built-up Roof	97	97	97	97	97	97	97	97	97	97		97	97	97	97	97	97	97	97	97	97	97	97	97	97
Replace Metal Roof																					2,240				
Minor Replacement, Metal Roof (2% of Roof)	44																								
Repair Metal Roof	51					51					51					51									
Maintain Aluminum Gutter, Downspouts, Fittings		17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17		17	17	17	17
Non-Destructive Moisture Inspection, Built-up Roof	166					166										166					166				

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
B10 Super Structure																									
Replace Steel Roof Access Ladder																									
Repair Steel Roof Access Ladder											987														
B20 Exterior Enclosure																									
Repair Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz	700										700										700				
Repair Steel, Painted, Exterior Door	611															611									
Refinish Steel, Painted, Exterior Door						95										95									
Replace Steel, Painted, Exterior Door Locks						1,048										1,048									
Maintain Steel, Painted, Exterior Door Locks	69					69					69					69					69				
Finish Replaced Steel, 14'x10', Painted, Overhead Coiling Do																									
Finish Replaced Steel, 10'x8', Painted, Overhead Coiling Door																									
Replace Steel, 14'x10', Painted, Overhead Coiling Door, Moto																									
Replace Steel, 10'x8', Painted, Overhead Coiling Door, Motori																									
Refinish Steel, 14'x10', Painted, Overhead Coiling Door, Moto	177										177										177				
Repair Steel, 14'x10', Painted, Overhead Coiling Door, Motori	700										700										700				
Clean & Seal Concrete Block, Exterior, 2nd Floor						3,716										3,716									
Refinish Aluminum Louver, 1st Floor						125																			
Replace Aluminum Louver, 1st Floor																1,236									
Clean & Seal Concrete Block, Exterior, 1st Floor						2,859										2,859									
Refinish Steel, 10'x8', Painted, Overhead Coiling Door, Motori	177										177										177				
Repoint (50% surface) Concrete Block, Exterior, 1st Floor						5,851																			
Maintain Steel, 14'x10', Painted, Overhead Coiling Door, Moto	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
Repair Concrete Block, Exterior, 2nd Floor (2% of Walls)						549																			
Repoint (50% surface) Concrete Block, Exterior, 2nd Floor						6,021																			
Repair Glass Block Window, 1st Floor (2% of Glass)						37										37									
Repair Glass Block Window, 2nd Floor (2% of Glass)						104										104									
Maintain Steel, 10'x8', Painted, Overhead Coiling Door, Motori	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
Repair Concrete Block, Exterior, 1st Floor (2% of Walls)						577																			
B30 Roofing																									
Maintain Metal Roof	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Maintain Built-up Roof	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97		97	97	97	97	97	97	97	97	97
Replace Metal Roof																									
Minor Replacement, Metal Roof (2% of Roof)																44									
Repair Metal Roof	51					51					51					51					51				
Maintain Aluminum Gutter, Downspouts, Fittings	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17		17	17	17	17	17	17	17	17	17
Non-Destructive Moisture Inspection, Built-up Roof	166					166					166										166				

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Aluminum Gutter, Downspouts, Fittings	378																				378				
Replace Membrane, Built-up Roof											26,826														
Place New Membrane Over Existing, Built-up Roof																									
C10 Interior Construction																									
Finish Replaced Steel, 10'x8', Painted, Overhead Coiling Door,																354									
Refinish Steel, Painted, Interior Door	95				95				95				95				95				95				95
Maintain Steel, Painted, Interior Door Locks	69					69					69					69					69				
Replace Steel, Painted, Interior Door Locks	1,002										1,002										1,002				
Maintain Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210		210	210	210	210	210	210	210	210	210
Repair Steel, 10'x8', Painted, Overhead Coiling Door, Motorize	1,399										1,399														
Refinish Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz	354										354														
Replace Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz																9,414									
C20 Stairs																									
Finish Replaced Metal, Painted, Interior Railing																									
Replace Metal, Painted, Interior Railing																									
Finish Repaired Metal, Painted, Interior Railing											1														
Refinish Metal, Painted, Interior Railing	25				25				25				25				25				25				25
Repair Metal, Painted, Interior Railing											37														
C30 Interior Finishes																									
Repair Concrete Flooring (2% of Floors)											39														
Replace Plywood Flooring																					299				
Finish Repaired Metal, Painted Ceiling						84																			
Repair Metal, Painted Ceiling (2% of Ceiling)						1,556																			
Refinish Metal, Painted Ceiling	4,191										4,191										4,191				
Replace Acoustical Tile, Dropped Ceiling																335									
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)								6																	6
Replace Vinyl Sheet Flooring																	759								
Repair Vinyl Sheet Flooring (2% of Floors)								13																	
Repair Concrete, Painted Flooring (2% of Floors)											461														
Finish Repaired Concrete, Painted Flooring											45														
Refinish Concrete Block, Painted, Interior Wall Finish	5,858										5,858										5,858				
Refinish Concrete, Painted Flooring	2,287										2,287										2,287				
Repair Plywood Flooring (2% of Floors)	6										6														
Finish Repaired Concrete Block, Painted, Interior Wall Finish						118																			
Repoint (50% surface) Concrete Block, Painted, Interior Wall Fi						18,145																			
Repair Concrete Block, Painted, Interior Wall Finish (2% of Wal						1,528																			

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Aluminum Gutter, Downspouts, Fittings																378									
Replace Membrane, Built-up Roof																26,826									
Place New Membrane Over Existing, Built-up Roof	12,690																								
C10 Interior Construction																									
Finish Replaced Steel, 10'x8', Painted, Overhead Coiling Door																									
Refinish Steel, Painted, Interior Door				95				95				95				95				95				95	
Maintain Steel, Painted, Interior Door Locks	69					69					69					69					69				
Replace Steel, Painted, Interior Door Locks						1,002										1,002									
Maintain Steel, 10'x8', Painted, Overhead Coiling Door, Motori	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210
Repair Steel, 10'x8', Painted, Overhead Coiling Door, Motoriz	1,399										1,399										1,399				
Refinish Steel, 10'x8', Painted, Overhead Coiling Door, Motori	354										354										354				
Replace Steel, 10'x8', Painted, Overhead Coiling Door, Motori																									
C20 Stairs																									
Finish Replaced Metal, Painted, Interior Railing						25																			
Replace Metal, Painted, Interior Railing						606																			
Finish Repaired Metal, Painted, Interior Railing	1																				1				
Refinish Metal, Painted, Interior Railing				25						25				25				25				25			
Repair Metal, Painted, Interior Railing	37																				37				
C30 Interior Finishes																									
Repair Concrete Flooring (2% of Floors)	39															39									
Replace Plywood Flooring																									
Finish Repaired Metal, Painted Ceiling						84																			
Repair Metal, Painted Ceiling (2% of Ceiling)						1,556																			
Refinish Metal, Painted Ceiling						4,191										4,191									
Replace Acoustical Tile, Dropped Ceiling																									
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)									6									6							
Replace Vinyl Sheet Flooring										759															
Repair Vinyl Sheet Flooring (2% of Floors)	13																		13						
Repair Concrete, Painted Flooring (2% of Floors)	461															461									
Finish Repaired Concrete, Painted Flooring	45															45									
Refinish Concrete Block, Painted, Interior Wall Finish						5,858										5,858									
Refinish Concrete, Painted Flooring						2,287										2,287									
Repair Plywood Flooring (2% of Floors)						6										6									
Finish Repaired Concrete Block, Painted, Interior Wall Finish						118																			
Repoint (50% surface) Concrete Block, Painted, Interior Wall						18,145																			
Repair Concrete Block, Painted, Interior Wall Finish (2% of W						1,528																			

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
D10 Conveying																									
Maintain Bridge Crane, Overhead, 3 Ton	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Replace Bridge Crane, Overhead, 3 Ton						66,146																			
D20 Plumbing																									
Re-tape Pipe Insulation, Fiberglass, Hot Water	28										28					28					28				
Replace 10' Section, Pipe & Fittings, 2" Steel					51												51								
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Cold Water	25																								
Resolder Joint, Pipe & Fittings, 3/4" Copper, Cold Water	51															51									
Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pipe						508																			
Resolder Joint, Pipe & Fittings, 3/4" Copper, Hot Water	51															51									
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Hot Water	25																								
Replace Pipe & Fittings, 3/4" Copper, Hot Water (20% of Pipe)						508																			
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel						30																			
Replace 10' Section, Pipe & Fittings, 4" Steel					77												77								
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel						37																			
Replace Gate Valve, 4"															1,873										
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insula						95																			
Repair Strainer, Sink, Iron, Enamel					84								84											84	
Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insulati						95																			
Check Operation, Water Heater, Electric, 30 Gal.						29			29			29			29						29			29	
Drain & Flush Water Heater, Electric, 30 Gal.		233								233							233								233
Replace Water Heater, Electric, 30 Gal.			1,372															1,372							
Re-tape Pipe Insulation, Fiberglass, Cold Water	28										28					28					28				
Replace Flush Tank Water Closet, One Piece																904									
Replace Floor Drain																					1,310				
Replace 10' Section, Pipe & Fittings, 3" Cast Iron					22												22								
Replace Coolant & Adjust Drinking Fountain, Refrigerated		35		35		35		35				35		35		35		35				35		35	
Replace Drinking Fountain, Refrigerated										1,064										1,064					
Inspect & Clean Spray Heads, Emergency Eye Wash			29			29			29			29			29			29			29			29	
Repack Valve Glands, Emergency Eye Wash										35										35					
Replace Emergency Eye Wash Station																									1,023
Replace Washer in Ball Cock, Flush Tank Water Closet, One P	37					37					37										37				
Replace Service Sink, Iron, Enamel																1,089									
Install Gasket in Spud Connection, Flush Tank Water Closet, O	30																								
Repack Gland, Gate Valve, 4"					63								63										63		
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chin	29		29		29		29		29		29		29		29			29		29		29		29	

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
D10 Conveying																									
Maintain Bridge Crane, Overhead, 3 Ton	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Replace Bridge Crane, Overhead, 3 Ton						66,146																			
D20 Plumbing																									
Re-tape Pipe Insulation, Fiberglass, Hot Water	28										28					28					28				
Replace 10' Section, Pipe & Fittings, 2" Steel				51												51									
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Cold Water	25																								
Resolder Joint, Pipe & Fittings, 3/4" Copper, Cold Water	51															51									
Replace Pipe & Fittings, 3/4" Copper, Cold Water (20% of Pip						508																			
Resolder Joint, Pipe & Fittings, 3/4" Copper, Hot Water	51															51									
Replace 10' Section, Pipe & Fittings, 3/4" Copper, Hot Water	25																								
Replace Pipe & Fittings, 3/4" Copper, Hot Water (20% of Pipe						508																			
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel						30																			
Replace 10' Section, Pipe & Fittings, 4" Steel				77												77									
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel						37																			
Replace Gate Valve, 4"							1,873																	1,873	
Replace Pipe Insulation, Fiberglass, Cold Water (20% of Insul						95																			
Repair Strainer, Sink, Iron, Enamel							84								84								84		
Replace Pipe Insulation, Fiberglass, Hot Water (20% of Insula						95																			
Check Operation, Water Heater, Electric, 30 Gal.		29			29						29			29			29			29					
Drain & Flush Water Heater, Electric, 30 Gal.							233								233							233			
Replace Water Heater, Electric, 30 Gal.								1,372															1,372		
Re-tape Pipe Insulation, Fiberglass, Cold Water	28										28					28					28				
Replace Flush Tank Water Closet, One Piece																									
Replace Floor Drain																									
Replace 10' Section, Pipe & Fittings, 3" Cast Iron				22												22									
Replace Coolant & Adjust Drinking Fountain, Refrigerated	35		35				35		35		35		35				35		35		35		35		
Replace Drinking Fountain, Refrigerated					1,064										1,064										1,064
Inspect & Clean Spray Heads, Emergency Eye Wash			29			29			29			29			29			29			29			29	
Repack Valve Glands, Emergency Eye Wash										35										35					
Replace Emergency Eye Wash Station																									1,023
Replace Washer in Ball Cock, Flush Tank Water Closet, One	37					37					37					37					37				
Replace Service Sink, Iron, Enamel																									
Install Gasket in Spud Connection, Flush Tank Water Closet,											30														
Repack Gland, Gate Valve, 4"						63									63								63		
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chi	29		29		29		29		29		29		29		29		29		29		29		29		29

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Washer & Spud Connection, Lavatory, Vitreous China		46							46														46		
Replace Valve Set, Lavatory, Vitreous China	148										148														
Replace Lavatory, Vitreous China																502									
Replace Faucet Washer & Clean Trap, Sink, Iron, Enamel	29		29		29		29		29		29		29		29			29		29		29		29	
Replace Valve Set, Service Sink, Iron, Enamel	148										148														
Repack Gland, Gate Valve, 2-3"					440								440										440		
Replace Gate Valve, 2-3"															4,064										
Replace Worn Parts, Flush Tank Water Closet, One Piece											103														
Maintain Floor Drain	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136		136	136	136	136
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron						9																			
Replace 10' Section, Pipe & Fittings, 4" Cast Iron					167												167								
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron						54																			
Replace 10' Section, Pipe & Fittings, 3" Cast Iron					106												106								
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron						43																			
Maintain Roof Drain, 4-6"	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139		139	139	139	139
Replace Roof Drain, 4-6"																					2,256				
D30 HVAC																									
Replace Exhaust Fan, Centrifugal, 2,000 Cfm											2,041														
Repair Exhaust Fan, Centrifugal, 2,000 Cfm								264												264					
Maintain Exhaust Fan, Centrifugal, 2,000 Cfm	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123	123
Replace Air Handler, Single Zone, 2,500 Cfm													9,474												
Repair Air Handler, Single Zone, 2,500 Cfm			2,046																				2,046		
Maintain Air Handler, Single Zone, 2,500 Cfm	484	484	484	484	484	484	484	484	484	484	484	484		484	484	484	484	484	484	484	484	484	484	484	484
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of Ins						335																			
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Actu						30					30					30									
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel						54																			
Maintain Unit Heater, 480v, 5kW	161	161	161	161	161	161	161	161	161	161	161	161		161	161	161	161	161	161	161	161	161	161	161	161
Replace 10' Section, Pipe & Fittings, 2" Steel					90												90								
Re-tape Pipe Insulation, Fiberglass, Chilled Water	99										99					99					99				
Refinish Steel Damper, Motorized, w/ Actuator											70														
Replace Steel Damper, Motorized, w/ Actuator	1,056																				1,056				
Replace Flow Control Valve, Motorized, 2"																	1,738								
Maintain Unit Heater, 12 Mbh	323	323	323	323	323	323	323	323	323	323	323	323		323	323	323	323	323	323	323	323	323	323	323	323
Monitor Direct Digital Controls, System Points	1,361	1,361	1,361	1,361	1,361	1,361	1,361		1,361	1,361	1,361	1,361	1,361	1,361	1,361	1,361	1,361		1,361	1,361	1,361	1,361	1,361	1,361	1,361
Repair Unit Heater, 12 Mbh	1,062																								
Repair Unit Heater, 480v, 5kW	168																								
Replace Unit Heater, 12 Mbh													1,522												

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Washer & Spud Connection, Lavatory, Vitreous Chin					46							46							46						
Replace Valve Set, Lavatory, Vitreous China	148										148										148				
Replace Lavatory, Vitreous China																									
Replace Faucet Washer & Clean Trap, Sink, Iron, Enamel	29		29		29		29		29		29		29		29		29		29		29		29		29
Replace Valve Set, Service Sink, Iron, Enamel	148										148										148				
Repack Gland, Gate Valve, 2-3"						440									440								440		
Replace Gate Valve, 2-3"							4,064																	4,064	
Replace Worn Parts, Flush Tank Water Closet, One Piece						103															103				
Maintain Floor Drain	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron						9																			
Replace 10' Section, Pipe & Fittings, 4" Cast Iron				167												167									
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron						54																			
Replace 10' Section, Pipe & Fittings, 3" Cast Iron				106												106									
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron						43																			
Maintain Roof Drain, 4-6"	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139
Replace Roof Drain, 4-6"																									
D30 HVAC																									
Replace Exhaust Fan, Centrifugal, 2,000 Cfm	2,041															2,041									
Repair Exhaust Fan, Centrifugal, 2,000 Cfm										264															264
Maintain Exhaust Fan, Centrifugal, 2,000 Cfm		123	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123
Replace Air Handler, Single Zone, 2,500 Cfm				9,474																9,474					
Repair Air Handler, Single Zone, 2,500 Cfm															2,046										
Maintain Air Handler, Single Zone, 2,500 Cfm	484	484	484		484	484	484	484	484	484	484	484	484	484	484	484	484	484	484		484	484	484	484	484
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of In						335																			
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Act	30					30					30										30				
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel						54																			
Maintain Unit Heater, 480v, 5kW	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161		161	161	161	161	161
Replace 10' Section, Pipe & Fittings, 2" Steel				90												90									
Re-tape Pipe Insulation, Fiberglass, Chilled Water	99										99					99					99				
Refinish Steel Damper, Motorized, w/ Actuator						70																			
Replace Steel Damper, Motorized, w/ Actuator																1,056									
Replace Flow Control Valve, Motorized, 2"																									
Maintain Unit Heater, 12 Mbh	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323		323	323	323	323	323
Monitor Direct Digital Controls, System Points	1,361	1,361		1,361	1,361	1,361	1,361	1,361	1,361	1,361	1,361	1,361		1,361	1,361	1,361	1,361	1,361	1,361	1,361	1,361	1,361		1,361	1,361
Repair Unit Heater, 12 Mbh							1,062																		
Repair Unit Heater, 480v, 5kW							168																		
Replace Unit Heater, 12 Mbh																				1,522					

Building: Models Preparation Building **Facility:** Glenn Research Center

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Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Unit Heater, 480v, 5kW													1,042												
Replace Direct Digital Controls, System Points								32,726										32,726							
Replace Thermostat	1,211										1,211										1,211				
Replace Finned Radiator, 10 ft.											3,002														
Replace Flow Control Valve, Motorized, 2"															1,665										
Replace 10' Section, Pipe & Fittings, 1" Copper, Fuel Oil	116																								
Replace Pipe & Fittings, 1" Copper, Fuel Oil (20% of Pipe)						2,303																			
Maintain Thermostat		86	86	86	86	86	86	86	86	86		86	86	86	86	86	86	86	86	86		86	86	86	86
Resolder Joint, Pipe & Fittings, 2" Copper, Fuel Oil	205															205									
Replace 10' Section, Pipe & Fittings, 2" Copper, Fuel Oil	229																								
Replace Pipe & Fittings, 2" Copper, Fuel Oil (20% of Pipe)						4,568																			
Maintain Hydraulic Power Unit, 10 Gal.	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176		176	176	176	176	176	176	176
Repair Hydraulic Power Unit, 10 Gal.	1,044			1,044			1,044			1,044			1,044			1,044					1,044			1,044	
Repair Hydraulic Power Unit, 10 Gal., Motor, 10 Gal.			3,938					3,938					3,938										3,938		
Replace Hydraulic Power Unit, 10 Gal.																		13,914							
Replace Valve Actuator, 2"													1,191												
Replace Valve Actuator, 2"	1,190										1,190														1,190
Resolder Joint, Pipe & Fittings, 1" Copper, Fuel Oil	205															205									
Replace 10' Section, Pipe & Fittings, 2" Steel					90												90								
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel						54																			
Repack Gland, Gate Valve, 2-3"					253														253						
Replace Gate Valve, 2-3"											2,324														
Re-tape Pipe Insulation, Fiberglass, Heating Water/Steam	99										99					99					99				
Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20						450																			
Maintain Steam Trap, F&T, 1"	87	87	87	87		87	87	87	87	87	87	87		87	87	87	87	87	87	87		87	87	87	87
Repair Steam Trap, F&T, 1"	849		849				849		849		849				849		849		849				849		849
Replace Steam Trap, F&T, 1"					739								739								739				
Maintain Flow Control Valve & Actuator, 2"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108		108	108	108	108	108	108	108	108
Maintain Flow Control Valve & Actuator, 2"	107	107	107	107	107	107	107	107	107	107	107	107	107	107		107	107	107	107	107	107	107	107	107	107
D40 Fire Protection																									
Replace Fire Extinguisher						957												957							
Inspect & Test Fire Extinguisher				104							104					104							104		
D50 Electrical																									
Repair Power Panel Board, 480 V, 200 Amp.	143																				143				
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 150											685														
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w	1,712																				1,712				

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Unit Heater, 480v, 5kW																				1,042					
Replace Direct Digital Controls, System Points			32,726										32,726										32,726		
Replace Thermostat						1,211										1,211									
Replace Finned Radiator, 10 ft.	3,002															3,002									
Replace Flow Control Valve, Motorized, 2"							1,665																	1,665	
Replace 10' Section, Pipe & Fittings, 1" Copper, Fuel Oil	116																								
Replace Pipe & Fittings, 1" Copper, Fuel Oil (20% of Pipe)						2,303																			
Maintain Thermostat	86	86	86	86	86		86	86	86	86	86	86	86	86	86		86	86	86	86	86	86	86	86	86
Resolder Joint, Pipe & Fittings, 2" Copper, Fuel Oil	205															205									
Replace 10' Section, Pipe & Fittings, 2" Copper, Fuel Oil	229																								
Replace Pipe & Fittings, 2" Copper, Fuel Oil (20% of Pipe)						4,568																			
Maintain Hydraulic Power Unit, 10 Gal.	176	176	176	176	176	176	176	176	176	176	176	176		176	176	176	176	176	176	176	176	176	176	176	176
Repair Hydraulic Power Unit, 10 Gal.		1,044			1,044			1,044			1,044					1,044			1,044			1,044			1,044
Repair Hydraulic Power Unit, 10 Gal., Motor, 10 Gal.			3,938					3,938										3,938					3,938		
Replace Hydraulic Power Unit, 10 Gal.													13,914												
Replace Valve Actuator, 2"																								1,191	
Replace Valve Actuator, 2"																	1,190								
Resolder Joint, Pipe & Fittings, 1" Copper, Fuel Oil	205															205									
Replace 10' Section, Pipe & Fittings, 2" Steel				90												90									
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel						54																			
Repack Gland, Gate Valve, 2-3"									253															253	
Replace Gate Valve, 2-3"	2,324															2,324									
Re-tape Pipe Insulation, Fiberglass, Heating Water/Steam	99										99					99					99				
Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20						450																			
Maintain Steam Trap, F&T, 1"	87	87	87		87	87	87	87	87	87	87		87	87	87	87	87	87	87		87	87	87	87	87
Repair Steam Trap, F&T, 1"		849				849		849		849				849		849		849				849		849	
Replace Steam Trap, F&T, 1"				739								739								739					
Maintain Flow Control Valve & Actuator, 2"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Maintain Flow Control Valve & Actuator, 2"	107	107	107	107	107	107		107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107
D40 Fire Protection																									
Replace Fire Extinguisher					957												957								
Inspect & Test Fire Extinguisher			104							104					104								104		
D50 Electrical																									
Repair Power Panel Board, 480 V, 200 Amp.						143																			
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 15						685																			
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w																1,712									

Building: Models Preparation Building **Facility:** Glenn Research Center

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Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Receptacle, 120 V, 15 Amp.	1,621																				1,621				
Replace Receptacle, 120 V, 20 Amp.	525																				525				
Replace Receptacle, 208 V, 3 phase	1,428																				1,428				
Repair Wiring Device, Switch	773																				773				
Replace Wiring Device, Switch											725														
Annual PM, Motion Detector	37	37	37		37	37	37	37	37	37	37	37	37		37	37	37	37	37	37	37	37	37		37
Replace Motion Detector				2,691										2,691										2,691	
Maintain Card Reader w/ Keypad	363	363	363		363	363	363	363	363	363	363	363	363		363	363	363	363	363	363	363	363	363		363
Replace Access Card Reader w/ Keypad				4,979										4,979										4,979	
Replace Electric Lock				1,309										1,309										1,309	
Replace Fire Alarm Horn & Strobe	532																				532				
Check Operation, Heat Detector	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30	30	30	30	30	30	30	30	30	30
Repair Heat Detector	62																				62				
Replace Heat Detector											183														
Maintain Intrusion Detection Motion Detector, Interior	91	91	91		91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91		91
Replace Intrusion Detection Motion Detector, Interior				1,393										1,393										1,393	
Check & Repair Manual Pull Station	64																				64				
Replace Manual Pull Station											151														
Maintain Public Address Speaker	90	90	90	90	90	90	90	90	90	90		90	90	90	90	90	90	90	90	90	90	90	90	90	90
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150						348					348					348									
Replace Public Address Speaker											1,005														
Replace Power Panel Board, 480 V, 200 Amp.											8,810														
Maintain Disconnect Switch, 30 Amp.	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
Repair Disconnect Switch, 30 Amp.	1,120										1,120										1,120				
Replace Disconnect Switch, 30 Amp.																									
Maintain Disconnect Switch, 60 Amp.	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
Repair Disconnect Switch, 60 Amp.	380										380										380				
Replace Disconnect Switch, 60 Amp.																									
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	181	181	181	181	181	181	181	181	181	181		181	181	181	181	181	181	181	181	181	181	181	181	181	181
Repair Power Panel Board, 208 Y/120 V, 100 Amp.	285																				285				
Maintain Secondary Transformer, Dry, 45 kVA	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91
Maintain Power Panel Board, 480 V, 200 Amp.	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91	91	91	91
Replace Incandescent Lighting Fixture, Basic, 100 w	311																				311				
Repair Secondary Transformer, Dry, 45 kVA	327																				327				
Replace Secondary Transformer, Dry, 45 kVA											6,061														
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/ B			79		79		79		79		79		79		79		79		79				79		79
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/ Ba											42														

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Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Receptacle, 120 V, 15 Amp.																1,621									
Replace Receptacle, 120 V, 20 Amp.																525									
Replace Receptacle, 208 V, 3 phase																1,428									
Repair Wiring Device, Switch											773														
Replace Wiring Device, Switch	725															725									
Annual PM, Motion Detector	37	37	37	37	37	37	37	37		37	37	37	37	37	37	37	37	37		37	37	37	37	37	37
Replace Motion Detector									2,691										2,691						
Maintain Card Reader w/ Keypad	363	363	363	363	363	363	363	363		363	363	363	363	363	363	363	363	363		363	363	363	363	363	363
Replace Access Card Reader w/ Keypad									4,979										4,979						
Replace Electric Lock									1,309										1,309						
Replace Fire Alarm Horn & Strobe																532									
Check Operation, Heat Detector		30	30	30	30	30	30	30	30	30	30	30	30	30	30		30	30	30	30	30	30	30	30	30
Repair Heat Detector											62														
Replace Heat Detector	183															183									
Maintain Intrusion Detection Motion Detector, Interior	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91		91	91	91	91	91	91
Replace Intrusion Detection Motion Detector, Interior									1,393										1,393						
Check & Repair Manual Pull Station											64														
Replace Manual Pull Station	151															151									
Maintain Public Address Speaker		90	90	90	90	90	90	90	90	90	90	90	90	90	90		90	90	90	90	90	90	90	90	90
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150	348					348					348										348				
Replace Public Address Speaker	1,005															1,005									
Replace Power Panel Board, 480 V, 200 Amp.																8,810									
Maintain Disconnect Switch, 30 Amp.	179	179	179	179	179		179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
Repair Disconnect Switch, 30 Amp.																1,120									
Replace Disconnect Switch, 30 Amp.						2,625																			
Maintain Disconnect Switch, 60 Amp.	59	59	59	59	59		59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
Repair Disconnect Switch, 60 Amp.																380									
Replace Disconnect Switch, 60 Amp.						1,741																			
Maintain Power Panel Board, 208 Y/120 V, 100 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181		181	181	181	181	181	181	181	181	181
Repair Power Panel Board, 208 Y/120 V, 100 Amp.						285																			
Maintain Secondary Transformer, Dry, 45 kVA	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91
Maintain Power Panel Board, 480 V, 200 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91
Replace Incandescent Lighting Fixture, Basic, 100 w																311									
Repair Secondary Transformer, Dry, 45 kVA						327																			
Replace Secondary Transformer, Dry, 45 kVA																6,061									
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/		79		79		79		79		79		79		79				79		79		79		79	
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/						42																			

Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Emergency Lighting Pack, 2 Light w/ Battery	1,147																				1,147				
Replace Lamp, Exit Lighting Fixture, w/ Battery						159					159					159									
Replace Exit Lighting Fixture, w/ Battery	764																				764				
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 4-											4,947														
Replace Fluorescent Lighting Fixture, T12, 4-60 w	8,151																				8,151				
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w						25					25					25									
Replace Power Panel Board, 208 Y/120 V, 100 Amp.											9,165														
G30 Site Mechanical Utilities																									
Replace Nitrogen Storage Tank, 500 Gal.				42,732																					
Maintain Nitrogen Storage Tank, 500 Gal.	3,140	3,140	3,140		3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140

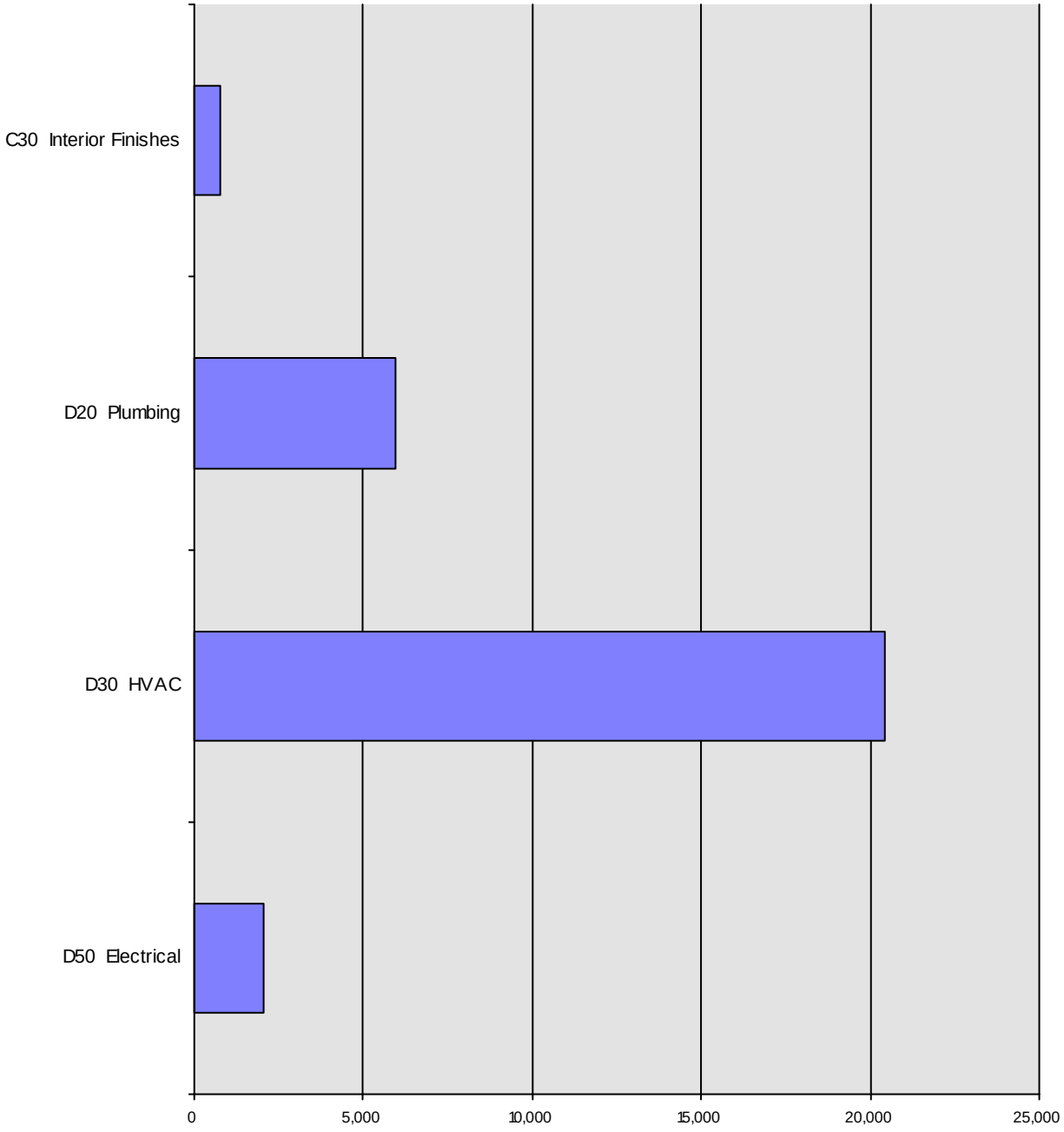
Building: Models Preparation Building **Facility:** Glenn Research Center

Building Num: 0061 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Emergency Lighting Pack, 2 Light w/ Battery																1,147									
Replace Lamp, Exit Lighting Fixture, w/ Battery	159					159					159										159				
Replace Exit Lighting Fixture, w/ Battery																764									
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 4						4,947																			
Replace Fluorescent Lighting Fixture, T12, 4-60 w																8,151									
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w	25					25					25										25				
Replace Power Panel Board, 208 Y/120 V, 100 Amp.																9,165									
G30 Site Mechanical Utilities																									
Replace Nitrogen Storage Tank, 500 Gal.																									
Maintain Nitrogen Storage Tank, 500 Gal.	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140

Building Deferred Maintenance by System Chart

Building: Models Preparation Building **Building Num:** 0061



All costs expressed in ($) 2012. Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral and is included in Total Deferred Maintenance.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: Models Preparation Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1993
Original Cost: $1
Replacement Value: $2,087,887
per SF: $772

Building Type: Maintenance Shop
Building Gsft: 2,705
Building Number: 0061

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1993	4	Replace Air Handler, Single Zone, 2,500 Cfm	$9,474	$0	$9,474
1993	3	Replace Gate Valve, 2-3"	$4,064	$0	$4,064
1993	5	Replace Finned Radiator, 10 ft.	$3,002	$0	$3,002
1993	5	Replace Gate Valve, 2-3"	$2,324	$0	$2,324
1993	5	Replace Exhaust Fan, Centrifugal, 2,000 Cfm	$2,041	$0	$2,041
1993	3	Replace Gate Valve, 4"	$1,873	$0	$1,873
1993	3	Replace Flow Control Valve, Motorized, 2"	$1,665	$0	$1,665
1993	10	Replace Thermostat	$1,211	$0	$1,211
1993	5	Replace Public Address Speaker	$1,005	$0	$1,005
1993	2	Replace Vinyl Sheet Flooring	$759	$0	$759
1993	12	Replace Steam Trap, F&T, 1"	$739	$0	$739
1993	5	Replace Wiring Device, Switch	$725	$0	$725
1993	5	Replace Heat Detector	$183	$0	$183
1993	5	Replace Manual Pull Station	$151	$0	$151
		Total	**$29,216**	**$0**	**$29,216**

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Operations Task Details

Whitestone Research

Building: Models Preparation Building **Year Built:** 1993 **Building Type:** Maintenance Shop

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0061

City: Cleveland, OH **Replacement Value:** $2,087,887 **per SF:** $772 **Building Gsft:** 2,705

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Custodial		**Level of Service: Low**			
Shop	2299	Damp Mop Hard Floors with 24 oz. Mop Head Using Double Bucket & Wringer	$964	$157	$1,121
Shop	2299	Empty Trash; Wipe Clean & Re-line Basket	$365	$59	$424
Storage	297	Sweep Hard Floor with 48" Push Broom	$6	$1	$7
Storage	297	Empty Trash; Wipe Clean & Re-line Basket	$4	$1	$5
Office	81	Vacuum Carpet with 14" Upright Vacuum	$32	$5	$38
Office	81	Empty Trash; Wipe Clean & Re-line Basket	$9	$2	$11
Office	81	Clean and Wipe Furniture with Trigger Sprayer & Cloth	$6	$1	$7
Office	81	Dust Surfaces with Duster	$4	$1	$5
Office	81	Vacuum Upholstered Furniture with Tank or Canister Vacuum	$4	$1	$4
Office	81	Dust Window Blinds	$2	$0	$2
Restroom	27	Service Restroom: Empty Trash, Clean & Disinfect Fixtures, Wipe Mirrors, Replace Supplies, Wet	$65	$11	$76
Restroom	27	Service Restroom: Empty Trash, Replace Supplies & Touch Up as Needed	$10	$2	$12
Total:			**$1,471**	**$239**	**$1,710**
Operation: Grounds		**Level of Service: Medium**			
Grounds, Improved	1623	Mow Turfgrass with 21" Power Mower	$95	$39	$134
Grounds, Improved	1623	Aerate Improved Grounds	$86	$36	$122
Grounds, Improved	1623	Clear Shrubs	$58	$24	$82
Grounds, Improved	1623	Overseed, Improved Grounds	$43	$18	$61
Grounds, Improved	1623	Edge Clean & Trim Walks with Gas Powered Edger	$36	$15	$51
Grounds, Improved	1623	Vacuum with 30" Billy Goat	$29	$12	$41
Grounds, Improved	1623	Clear Crabgrass	$22	$9	$31
Grounds, Improved	1623	Clear Weeds with 15" Boom, Improved Grounds	$11	$5	$16
Grounds, Improved	1623	Fertilize Improved Grounds	$9	$4	$12
Grounds, Improved	1623	Trim Around Raised Objects with String Edger	$7	$3	$11
Grounds, Improved	1623	Sweep with 30" Power Rake	$6	$2	$8
Grounds, Improved	1623	Fertilize Using Power Take Off Broadcast	$0	$0	$0

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Total:			**$402**	**$167**	**$569**
Operation: Pest Control		**Level of Service: Medium**			
Pest Controlled	2705	Install, or Check and Re-Bait 5 Rodent Boxes	$74	$31	$104
Pest Controlled	2705	Perform Crawling Insect Abatement	$55	$23	$78
Pest Controlled	2705	Inspect Building for Pests	$31	$0	$31
Total:			**$160**	**$54**	**$213**
Operation: Road Clearance		**Level of Service: Medium**			
Pavement NASA	2164	Plow Paved Area	$166	$50	$217
Total:			**$166**	**$50**	**$217**
Operation: Security		**Level of Service: Medium**			
Secured Area	2705	Patrol Building Perimeter	$457	$74	$532
Secured Area	2705	Guard Lobby/Parking	$0	$0	$0
Total:			**$457**	**$74**	**$532**

Building Operations Service Details

Whitestone Research

Building: Models Preparation Building | **Year Built:** 1993 | **FTEs:** 2 | **Building Type:** Maintenance Shop

Facility: Glenn Research Center | **Original Cost:** $1 | **Building Num:** 0061

City: Cleveland, OH | **Replacement Value:** $2,087,887 | **per SF:** $772 | **Building Gsft:** 2,705

	Service*	Quantity	Rate	Cost
Operation: Security	**Level of Service: Medium**			
	Intrusion Detection Systems	1	$4,986	$4,986
	System Monitoring	1	$3,615	$3,615
	Access Control	1	$2,690	$2,690
	Total:			**$11,291**
Operation: Telecom	**Level of Service: High**			
	Local Telephone	2	$468	$936
	Data	2	$3,588	$481
	Long Distance Telephone	2	$192	$384
	Total:			**$1,801**

All costs expressed in ($) 2012.

19-Dec-14

* Secutity may be composed of service and task based cost. See Building Operations Task Details for Security Tasks.

Building Operations Management Details

Whitestone Research

Building: Models Preparation Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1993
Original Cost: $1
Replacement Value: $2,087,887 **per SF:** $772

Building Type: Maintenance Shop
Building Num: 0061
Building Gsft: 2,705

	Service	Demand	UM	PRV	Cost
Operation: Management	**Level of Service: Low**				
	Management	0.3%	PRV	$2,087,887	$5,220
	Total:				**$5,220**

Attachment C: Detailed MARS Reports for GRC Property No. 37

Average M&R Costs

Whitestone Research

	Engine Research Building	**GSFT:**	7,479
Building Number:	0037	**PRV:**	$6,608,331
Facility:	Glenn Research Center	**Built Date:**	1942
City:	Cleveland, OH		

M&R Average Annual Cost Forecasts

	Current Year	5 Year	20 Year	50 Year
PM & Minor Repair:	$42,713	$42,321	$40,180	$40,427
Unscheduled Maintenance:	$22,228	$21,992	$20,790	$20,953
Renewal & Replacement:	$3,267	$150,172	$125,764	$105,933
Total M&R Costs:	$68,208	$214,485	$186,734	$167,313
Per GSFT:	$9.12	$28.68	$24.97	$22.37
As % of PRV:	1.03%	3.25%	2.83%	2.53%

All costs expressed in ($) 2012.

Based on a 50-Year Forecast.

Building Component List

Whitestone Research

Building: Engine Research Building **Year Built:** 1942 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0037

City: Cleveland, OH **Replacement Value:** $6,608,331 **per SF:** $884 **Building Gsft:** 7,479

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
B1010		Concrete Decking	1942	100 Sq Ft	Loading Dock	
B2010		Clay Brick, Exterior, 1st Floor	1942	690 Sq Ft		
B2010		Clay Brick, Exterior, 2nd Floor	1942	690 Sq Ft		
B2020		Aluminum Fixed Window, 12 sf, 1st Floor	1942	4 Each		
B2020		Aluminum Fixed Window, 12 sf, 2nd Floor	1942	6 Each		
B2030		Steel, Painted, Exterior Double Door	1942	1 Each		
B3010		Built-up Roof	1970	2493 Sq Ft		
C1020		Steel, Painted, Interior Door	1942	2 Each		
C1020		Steel, Painted, Interior Door	2000	1 Each		
C1020		Steel, Painted, Interior Double Door	2000	1 Each		
C1020		Steel, Painted, w/ Safety Glass, Interior Door	1990	2 Each		
C1020		Steel, Vault Security, Interior Door	1942	1 Each		
C2010		Concrete, Exterior Stairs	1942	30 Sq Ft		
C2010		Concrete, Interior Stairs	1942	20 Sq Ft		
C2010		Metal, Painted, Exterior Railing	1942	20 Ln Ft		
C2010		Metal, Painted, Interior Railing	1942	100 Ln Ft		
C2010		Metal, Painted, Interior Stairs	1942	90 Sq Ft		
C3010		Clay Brick, Painted, Interior Wall Finish	1942	1430 Sq Ft		
C3010		Concrete Block, Painted, Interior Wall Finish	1942	2050 Sq Ft		
C3010		Concrete, Painted, Interior Wall Finish	1942	3095 Sq Ft		
C3010		Gypsum Board, Interior Wall Finish	1990	350 Sq Ft		
C3020		Concrete, Painted Flooring	1942	6579 Sq Ft		
C3020		Metal Floor Grating	1990	200 Sq Ft		
C3020		Steel Flooring	1942	296 Sq Ft		
C3020		Vinyl Tile Flooring	2000	404 Sq Ft		
C3030		Acoustical Tile, Dropped Ceiling	1990	404 Sq Ft		
C3030		Concrete, Painted Ceiling	1942	6579 Sq Ft		
D1010		Crane, Jib, Electric, 1/2 Ton	1980	1 Each		

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D1010		Hoist Electric, Overhead, Chain, 1 Ton	2000	4 Each		
D1010		Hoist Electric, Overhead, Chain, 1/2 Ton	1970	2 Each		
D1010		Hoist Electric, Overhead, Chain, 5 Ton	2003	1 Each		4 Ton
D1010		Lift, Hydraulic, Single Post, 2,500 lbs	1995	1 Each	Mezz	Nozzle Lift
D1010		Nozzle Block Trolley System	1985	1 Each		
D2010		Lavatory, Vitreous China	1980	1 Each		
D2020		Pipe & Fittings, 3/4" Steel	1942	0.1 K Ln Ft		
D2030		Floor Drain	2010	6 Each		
D2030		Pipe & Fittings, 3" Cast Iron	2010	0.25 K Ln Ft		
D2030		Pipe & Fittings, 4" Cast Iron	2010	0.05 K Ln Ft		
D2040		Pipe & Fittings, 3" Cast Iron	1942	0.15 K Ln Ft		
D2040		Roof Drain, 4-6"	1942	1 Each		
D3010		Hydraulic Power Unit, 30 Gal.	1999	4 Each		
D3020		Pipe & Fittings, 1" Steel	1942	0.35 K Ln Ft		
D3020		Pipe & Fittings, 2" Steel	1995	0.05 K Ln Ft		
D3020		Pipe Insulation, Fiberglass, Heating Water/Steam	1990	0.45 K Ln Ft		
D3020		Steam Trap, F&T, 1"	1960	3 Each		
D3030		Ball Valve, 1"	1995	2 Each		
D3030	CVB-1	Calibrated Balancing Valve, 2"	1995	1 Each		for AC-1
D3030	CV-1	Flow Control Valve, Motorized, 1"	1995	1 Each		for AC-1
D3030	V	Flow Control Valve, Motorized, 1"	1980	1 Each		585psi Combustion/Injection air
D3030		Flow Control Valve, Motorized, 1"	2012	3 Each		
D3030		Flow Control Valve, Motorized, 1"	1995	1 Each		
D3030	F	Flow Control Valve, Motorized, 12"	1976	1 Each		Exp Proof Hydraulic
D3030	N	Flow Control Valve, Motorized, 16"	1980	1 Each		
D3030	W	Flow Control Valve, Motorized, 16"	1995	1 Each		
D3030	FCV-565	Flow Control Valve, Motorized, 16"	1960	1 Each		
D3030	H	Flow Control Valve, Motorized, 18"	1976	1 Each		Combustion air; Exp Proof Hydraulic
D3030	P	Flow Control Valve, Motorized, 2"	2005	1 Each		585psi Injection Air
D3030	Y, Z	Flow Control Valve, Motorized, 2"	2005	2 Each		585psi Combustion/Injection air
D3030	Q	Flow Control Valve, Motorized, 24"	1980	1 Each		
D3030	C	Flow Control Valve, Motorized, 24"	1990	1 Each		
D3030	J	Flow Control Valve, Motorized, 36"	1970	1 Each		
D3030	L	Flow Control Valve, Motorized, 36"	1976	1 Each		
D3030	U	Flow Control Valve, Motorized, 4"	1980	1 Each		40/150 psi Combustion/Injection air
D3030		Flow Control Valve, Motorized, 4"	1976	1 Each		

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D3030	T	Flow Control Valve, Motorized, 4"	1976	1 Each		3"
D3030	R	Flow Control Valve, Motorized, 6"	2000	1 Each		40/150 psi Combustion/Injection air
D3030	S	Flow Control Valve, Motorized, 6"	1976	1 Each		
D3030	V.602	Flow Control Valve, Motorized, 60"	1961	1 Each		
D3030	?	Flow Control Valve, Motorized, 8"	2005	1 Each		
D3030		Gate Valve, 12"	2010	1 Each		
D3030		Gate Valve, 2-3"	2000	1 Each		
D3030		Pipe & Fittings, 1" Steel	1995	0.1 K Ln Ft		
D3030		Pipe & Fittings, 4" Steel	1970	0.15 K Ln Ft		
D3030		Pipe & Fittings, 6" Steel	1970	0.15 K Ln Ft		
D3030		Pipe Insulation, Fiberglass, Chilled Water	1995	0.1 K Ln Ft		
D3040		Air Filters, Cartridge	1976	2 Each		
D3040		Air Handler, Single Zone, 1,300 Cfm	2012	1 Each	1	
D3040	AC-1	Air Handler, Single Zone, 8,000 Cfm	1995	1 Each	located in adjacent building but serve 1	
D3040		Duct Insulation, Fiberglass Blanket	1995	200 Sq Ft		
D3040		Ductwork	1995	400 Lbs		
D3040		Exhaust Fan, Roof Mounted, 1,500 Cfm	1998	1 Each		
D3040		Exhaust Fan, Roof Mounted, 5,000 Cfm	2006	1 Each		3648 Cfm
D3040		Pipe & Fittings, 12" Steel	1970	0.1 K Ln Ft		
D3040		Pipe & Fittings, 12" Steel	1990	0.15 K Ln Ft		
D3040		Pipe & Fittings, 16" Steel	1970	0.075 K Ln Ft		
D3040		Pipe & Fittings, 24" Stainless Steel	1970	0.15 K Ln Ft		
D3040		Pipe & Fittings, 24" Stainless Steel	1980	0.075 K Ln Ft		
D3040		Pipe & Fittings, 24" Stainless Steel	1990	0.075 K Ln Ft		
D3040		Pipe & Fittings, 60" Stainless Steel	1961	0.05 K Ln Ft		
D3040		Pipe & Fittings, 8" Steel	1970	0.075 K Ln Ft		
D3040		Steel Damper, Motorized, w/ Actuator	1995	2 Each		
D3050		Air Heater, 665 kW	1995	1 Each		
D3050		Unit Heater, 12 Mbh	1960	3 Each		
D3060		Direct Digital Controls, System Points	2010	555 Each		
D3060		Thermostat	1980	3 Each		
D3060		Thermostat	2012	1 Each		
D3060		Thermostat	1995	1 Each		
D4030		Fire Extinguisher	2012	6 Each		
D5010		Circuit Breaker, 600 V, 30-60 Amp., 3Ph.	1975	4 Each		30A
D5010		Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.	1996	1 Each		30A

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
D5010		Disconnect Switch, 30 Amp.	1975	1 Each		
D5010		Disconnect Switch, 30 Amp.	1975	3 Each		
D5010		Disconnect Switch, 30 Amp.	1996	1 Each		
D5010		Disconnect Switch, 30 Amp.	2000	1 Each		
D5010		Disconnect Switch, 30 Amp.	1995	1 Each		
D5010		Disconnect Switch, 400 Amp.	1970	1 Each		
D5010		Disconnect Switch, 60 Amp.	1970	2 Each		
D5010		Motor Starter, <5HP, <600V	2000	1 Each		
D5010		Motor Starter, <5HP, <600V	1970	1 Each		
D5010		Motor Starter, <5HP, <600V	1980	2 Each		
D5010		Motor Starter, 5-20 HP, <600 V	1975	2 Each		5HP
D5010	P0612A, B	Power Panel Board, 208 Y/120 V, 225 Amp	1996	2 Each		
D5010		Power Panel Board, 208 Y/120 V, 400 Amp.	1996	1 Each		
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1975	6 Each		
D5020		Fluorescent Lighting Fixture, T12, 2-40 w	1970	31 Each		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2000	7 Each		
D5020		High Pressure Sodium Lighting Fixture, 250 w	1995	11 Each		
D5020		Incandescent Lighting Fixture, Basic, 100 w	1970	16 Each		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150 w	1995	1 Each		
D5020		Receptacle, 208 V, 3 phase	1942	10 Each		
D5020		Receptacle, 208 V, 3 phase	1965	10 Each		
D5020		Receptacle, 120 V, 15 Amp.	1942	35 Each		
D5020		Receptacle, 120 V, 15 Amp.	1965	50 Each		
D5020		Wiring Device, Switch	1965	25 Each		
D5020		Wiring Device, Switch	1995	10 Each		
D5030		Camera, Interior, Closed Circuit, PTZ Color	2006	5 Each		
D5030		Card Reader w/ Keypad	2006	3 Each		
D5030		Electric Lock	2006	3 Each		
D5030		Fire Alarm Horn & Strobe	2006	3 Each		
D5030		Heat Detector	2000	2 Each		
D5030		Intrusion Detection Motion Detector, Interior	2006	5 Each		
D5030		Monitor, Large, Closed Circuit	2010	2 Each		
D5030		Monitor, Small, Closed Circuit	2010	10 Each		
D5030		Oxygen Monitoring System	2010	1 Each		
D5030		Public Address Speaker	1980	7 Each		
D5030		Security System Panel	2006	1 Each		

Uniformat	Asset Description	Component	Date	Quantity	Location	Notes
F1030		1x1 Pressure Certification	1942	1 Each		
F1030		1x1 Tunnel Controls	1942	1 Each		
F1030		1x1 Tunnel Valves	1942	1 Each		

Building Extended Component List with Remaining Service Life

Whitestone Research 04-Jun-15

Building: Engine Research Building **Year Built:** 1942 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0037

City: Cleveland, OH **Replacement Value:** $6,608,331 **per SF:** $884 **Building Gsft:** 7,479

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
B1010		Concrete Decking	1942	3	100 Sq Ft				Loading Dock	
B2010		Clay Brick, Exterior, 1st Floor	1942	3	690 Sq Ft					
B2010		Clay Brick, Exterior, 2nd Floor	1942	3	690 Sq Ft					
B2020		Aluminum Fixed Window, 12 sf, 1st Floor	1942	3	4 Each					
B2020		Aluminum Fixed Window, 12 sf, 2nd Floor	1942	3	6 Each					
B2030		Steel, Painted, Exterior Double Door	1942	3	1 Each					
B3010		Built-up Roof	1970	-14	2493 Sq Ft	$27,751	$0	$27,751		
C1020		Steel, Painted, Interior Door	2000	61	1 Each					
C1020		Steel, Painted, Interior Door	1942	3	2 Each					
C1020		Steel, Painted, Interior Double Door	2000	61	1 Each					
C1020		Steel, Painted, w/ Safety Glass, Interior Door	1990	51	2 Each					
C1020		Steel, Vault Security, Interior Door	1942	3	1 Each					
C2010		Concrete, Exterior Stairs	1942	-22	30 Sq Ft	$1,247	$0	$1,247		
C2010		Concrete, Interior Stairs	1942	3	20 Sq Ft					
C2010		Metal, Painted, Exterior Railing	1942	-42	20 Ln Ft	$1,008	$0	$1,008		
C2010		Metal, Painted, Interior Railing	1942	-22	100 Ln Ft	$3,028	$0	$3,028		
C2010		Metal, Painted, Interior Stairs	1942	3	90 Sq Ft					
C3010		Clay Brick, Painted, Interior Wall Finish	1942	3	1430 Sq Ft					
C3010		Concrete Block, Painted, Interior Wall Finish	1942	3	2050 Sq Ft					
C3010		Concrete, Painted, Interior Wall Finish	1942	3	3095 Sq Ft					
C3010		Gypsum Board, Interior Wall Finish	1990	51	350 Sq Ft					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
C3020		Concrete, Painted Flooring	1942	3	6579 Sq Ft					
C3020		Metal Floor Grating	1990	6	200 Sq Ft					
C3020		Steel Flooring	1942	3	296 Sq Ft					
C3020		Vinyl Tile Flooring	2000	4	404 Sq Ft					
C3030		Acoustical Tile, Dropped Ceiling	1990	11	404 Sq Ft					
C3030		Concrete, Painted Ceiling	1942	3	6579 Sq Ft					
D1010		Crane, Jib, Electric, 1/2 Ton	1980	-9	1 Each	$15,164	$0	$15,164		
D1010		Hoist Electric, Overhead, Chain, 1 Ton	2000	11	4 Each					
D1010		Hoist Electric, Overhead, Chain, 1/2 Ton	1970	4	2 Each					
D1010		Hoist Electric, Overhead, Chain, 5 Ton	2003	14	1 Each					4 Ton
D1010		Lift, Hydraulic, Single Post, 2,500 lbs	1995	6	1 Each				Mezz	Nozzle Lift
D1010		Nozzle Block Trolley System	1985	6	1 Each					
D2010		Lavatory, Vitreous China	1980	1	1 Each					
D2020		Pipe & Fittings, 3/4" Steel	1942	3	0.1 K Ln Ft					
D2030		Floor Drain	2010	36	6 Each					
D2030		Pipe & Fittings, 3" Cast Iron	2010	71	0.25 K Ln Ft					
D2030		Pipe & Fittings, 4" Cast Iron	2010	71	0.05 K Ln Ft					
D2040		Pipe & Fittings, 3" Cast Iron	1942	3	0.15 K Ln Ft					
D2040		Roof Drain, 4-6"	1942	-32	1 Each	$564	$0	$564		
D3010		Hydraulic Power Unit, 30 Gal.	1999	5	4 Each					
D3020		Pipe & Fittings, 1" Steel	1942	3	0.35 K Ln Ft					
D3020		Pipe & Fittings, 2" Steel	1995	56	0.05 K Ln Ft					
D3020		Pipe Insulation, Fiberglass, Heating Water/Ste	1990	1	0.45 K Ln Ft					
D3020		Steam Trap, F&T, 1"	1960	-46	3 Each	$1,108	$0	$1,108		
D3030		Ball Valve, 1"	1995	-2	2 Each	$828	$0	$828		
D3030	CVB-1	Calibrated Balancing Valve, 2"	1995	20	1 Each					for AC-1
D3030	CV-1	Flow Control Valve, Motorized, 1"	1995	17	1 Each					for AC-1
D3030		Flow Control Valve, Motorized, 1"	1995	17	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3030		Flow Control Valve, Motorized, 1"	2012	34	3 Each					
D3030	V	Flow Control Valve, Motorized, 1"	1980	2	1 Each					585psi Combustion/Injection air
D3030	F	Flow Control Valve, Motorized, 12"	1976	-2	1 Each	$23,367	$0	$23,367		Exp Proof Hydraulic
D3030	N	Flow Control Valve, Motorized, 16"	1980	2	1 Each					
D3030	W	Flow Control Valve, Motorized, 16"	1995	17	1 Each					
D3030	FCV-565	Flow Control Valve, Motorized, 16"	1960	-18	1 Each	$28,535	$0	$28,535		
D3030	H	Flow Control Valve, Motorized, 18"	1976	9	1 Each					Combustion air; Exp Proof Hydraulic
D3030	P	Flow Control Valve, Motorized, 2"	2005	27	1 Each					585psi Injection Air
D3030	Y, Z	Flow Control Valve, Motorized, 2"	2005	27	2 Each					585psi Combustion/Injection air
D3030	Q	Flow Control Valve, Motorized, 24"	1980	2	1 Each					
D3030	C	Flow Control Valve, Motorized, 24"	1990	12	1 Each					
D3030	J	Flow Control Valve, Motorized, 36"	1970	4	1 Each					
D3030	L	Flow Control Valve, Motorized, 36"	1976	4	1 Each					
D3030	U	Flow Control Valve, Motorized, 4"	1980	2	1 Each					40/150 psi Combustion/Injection air
D3030	T	Flow Control Valve, Motorized, 4"	1976	-2	1 Each	$3,456	$0	$3,456		3"
D3030		Flow Control Valve, Motorized, 4"	1976	-2	1 Each	$3,456	$0	$3,456		
D3030	R	Flow Control Valve, Motorized, 6"	2000	22	1 Each					40/150 psi Combustion/Injection air
D3030	S	Flow Control Valve, Motorized, 6"	1976	9	1 Each					
D3030	V.602	Flow Control Valve, Motorized, 60"	1961	3	1 Each					
D3030	?	Flow Control Valve, Motorized, 8"	2005	27	1 Each					
D3030		Gate Valve, 12"	2010	11	1 Each					
D3030		Gate Valve, 2-3"	2000	1	1 Each					
D3030		Pipe & Fittings, 1" Steel	1995	56	0.1 K Ln Ft					
D3030		Pipe & Fittings, 4" Steel	1970	31	0.15 K Ln Ft					
D3030		Pipe & Fittings, 6" Steel	1970	31	0.15 K Ln Ft					
D3030		Pipe Insulation, Fiberglass, Chilled Water	1995	6	0.1 K Ln Ft					
D3040		Air Filters, Cartridge	1976	NA	2 Each					
D3040		Air Handler, Single Zone, 1,300 Cfm	2012	14	1 Each				1	

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

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Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D3040	AC-1	Air Handler, Single Zone, 8,000 Cfm	1995	-3	1 Each	$21,113	$0	$21,113	located in adjacent building but serves NW1	1
D3040		Duct Insulation, Fiberglass Blanket	1995	7	200 Sq Ft					
D3040		Ductwork	1995	7	400 Lbs					
D3040		Exhaust Fan, Roof Mounted, 1,500 Cfm	1998	-1	1 Each					
D3040		Exhaust Fan, Roof Mounted, 5,000 Cfm	2006	7	1 Each					3648 Cfm
D3040		Pipe & Fittings, 12" Steel	1970	31	0.1 K Ln Ft					
D3040		Pipe & Fittings, 12" Steel	1990	51	0.15 K Ln Ft					
D3040		Pipe & Fittings, 16" Steel	1970	31	0.075 K Ln Ft					
D3040		Pipe & Fittings, 24" Stainless Steel	1980	41	0.075 K Ln Ft					
D3040		Pipe & Fittings, 24" Stainless Steel	1990	51	0.075 K Ln Ft					
D3040		Pipe & Fittings, 24" Stainless Steel	1970	31	0.15 K Ln Ft					
D3040		Pipe & Fittings, 60" Stainless Steel	1961	22	0.05 K Ln Ft					
D3040		Pipe & Fittings, 8" Steel	1970	31	0.075 K Ln Ft					
D3040		Steel Damper, Motorized, w/ Actuator	1995	1	2 Each					
D3050		Air Heater, 665 kW	1995	13	1 Each					
D3050		Unit Heater, 12 Mbh	1960	-22	3 Each	$2,283	$0	$2,283		
D3060		Direct Digital Controls, System Points	2010	6	555 Each					
D3060		Thermostat	2012	8	1 Each					
D3060		Thermostat	1980	-24	3 Each	$1,211	$0	$1,211		
D3060		Thermostat	1995	-9	1 Each	$404	$0	$404		
D4030		Fire Extinguisher	2012	10	6 Each					
D5010		Circuit Breaker, 600 V, 30-60 Amp., 3Ph.	1975	11	4 Each					30A
D5010		Circuit Breaker, Main, 240 V, 15-60 Amp., 3 P	1996	32	1 Each					30A
D5010		Disconnect Switch, 30 Amp.	2000	36	1 Each					
D5010		Disconnect Switch, 30 Amp.	1975	11	3 Each					
D5010		Disconnect Switch, 30 Amp.	1995	31	1 Each					
D5010		Disconnect Switch, 30 Amp.	1975	11	1 Each					
D5010		Disconnect Switch, 30 Amp.	1996	32	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

All costs expressed in ($) 2012.

**Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5010		Disconnect Switch, 400 Amp.	1970	6	1 Each					
D5010		Disconnect Switch, 60 Amp.	1970	6	2 Each					
D5010		Motor Starter, <5HP, <600V	2000	4	1 Each					
D5010		Motor Starter, <5HP, <600V	1980	-16	2 Each	$1,405	$0	$1,405		
D5010		Motor Starter, <5HP, <600V	1970	-26	1 Each	$703	$0	$703		
D5010		Motor Starter, 5-20 HP, <600 V	1975	-21	2 Each	$1,719	$0	$1,719		5HP
D5010	P0612A, B	Power Panel Board, 208 Y/120 V, 225 Amp	1996	12	2 Each					
D5010		Power Panel Board, 208 Y/120 V, 400 Amp.	1996	12	1 Each					
D5020		Emergency Lighting Pack, 2 Light w/ Battery	1975	-19	6 Each	$6,881	$0	$6,881		
D5020		Fluorescent Lighting Fixture, T12, 2-40 w	1970	-24	31 Each	$6,017	$0	$6,017		
D5020		Fluorescent Lighting Fixture, T8, 2-32w	2000	6	7 Each					
D5020		High Pressure Sodium Lighting Fixture, 250 w	1995	1	11 Each					
D5020		Incandescent Lighting Fixture, Basic, 100 w	1970	-24	16 Each	$2,489	$0	$2,489		
D5020		Metal Halide Lighting Fixture, Wall Mount, 150	1995	1	1 Each					
D5020		Receptacle, 208 V, 3 phase	1942	-52	10 Each	$1,428	$0	$1,428		
D5020		Receptacle, 208 V, 3 phase	1965	-29	10 Each	$1,428	$0	$1,428		
D5020		Receptacle, 120 V, 15 Amp.	1965	-29	50 Each	$2,701	$0	$2,701		
D5020		Receptacle, 120 V, 15 Amp.	1942	-52	35 Each	$1,891	$0	$1,891		
D5020		Wiring Device, Switch	1995	-4	10 Each	$454	$0	$454		
D5020		Wiring Device, Switch	1965	-34	25 Each	$1,133	$0	$1,133		
D5030		Camera, Interior, Closed Circuit, PTZ Color	2006	2	5 Each					
D5030		Card Reader w/ Keypad	2006	2	3 Each					
D5030		Electric Lock	2006	2	3 Each					
D5030		Fire Alarm Horn & Strobe	2006	12	3 Each					
D5030		Heat Detector	2000	1	2 Each					
D5030		Intrusion Detection Motion Detector, Interior	2006	2	5 Each					
D5030		Monitor, Large, Closed Circuit	2010	6	2 Each					
D5030		Monitor, Small, Closed Circuit	2010	6	10 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

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Forecast Year: 2013

***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

Uniformat	Asset Description	Component	Date	Remaining Service Life*	Quantity	Deferred** Maintenance	Degradation Cost***	Total Deferred Maintenance	Location	Notes
D5030		Oxygen Monitoring System	2010	11	1 Each					
D5030		Public Address Speaker	1980	-19	7 Each	$2,347	$0	$2,347		
D5030		Security System Panel	2006	2	1 Each					
F1030		1x1 Pressure Certification	1942	NA	1 Each					
F1030		1x1 Tunnel Controls	1942	NA	1 Each					
F1030		1x1 Tunnel Valves	1942	NA	1 Each					

*Remaining Service Life shows years until scheduled Replacement Task; blank implies there is no Replacement Task.

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***Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

§ Indicates Component set to have PM Tasks coincide with Replacement Task.

All costs expressed in ($) 2012.

Forecast Year: 2013

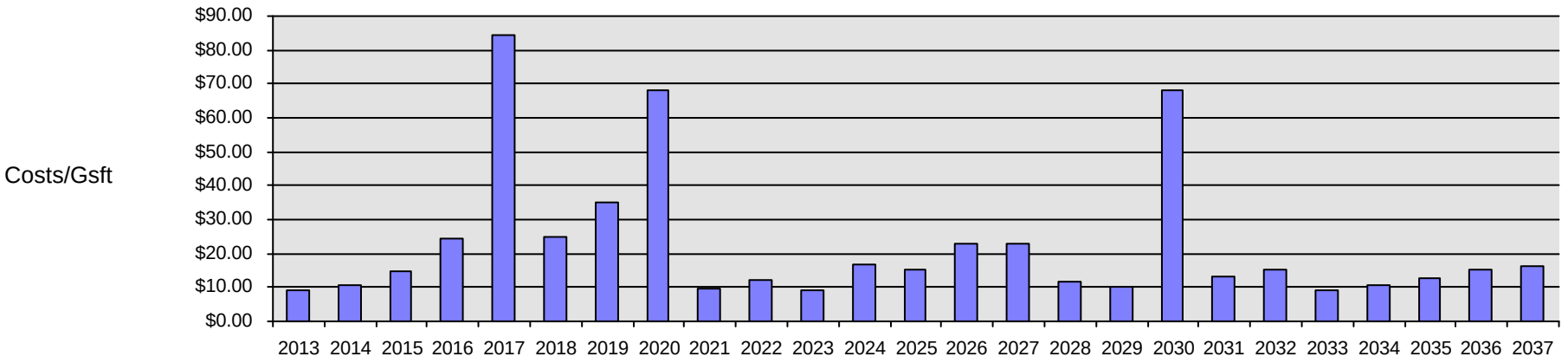
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Engine Research Building **Facility:** Glenn Research Center **City:** Cleveland, OH

7479

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
A10 Foundations																									
A20 Basement Construction																									
B10 Super Structure					0.36										0.02					0.01					0.02
B20 Exterior Enclosure					10.18					0.01					1.03					0.06					1.07
B30 Roofing	0.03	0.03	1.81	0.03	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	3.71	0.03	0.03	0.03	0.03	0.05	0.03	0.03
C10 Interior Construction		0.02	0.03	0.01	1.08	0.01		0.22	0.01	0.03		0.01	0.05	0.01	0.16	0.01	0.01	0.22		0.06	0.01	0.01	0.03	0.01	0.17
C20 Stairs		0.03			0.66	0.02			0.02	0.02			0.02	0.02			0.02	0.02		0.21	0.02	0.02			0.03
C30 Interior Finishes					61.24	0.25		0.47					0.18		3.48			0.08		0.19		0.00		0.25	3.48
D10 Conveying	2.25	2.25	2.25	2.25	2.25	2.25	3.00	7.06	2.25	2.25	2.25	2.25	3.74	2.25	2.25	3.67	2.25	3.95	2.25	2.25	2.25	2.25	2.25	2.25	2.25
D20 Plumbing	0.09	0.11	0.15	0.09	0.32	0.09	0.10	0.09	0.10	0.17	0.10	0.09	0.12	0.09	0.10	0.09	0.11	0.09	0.10	0.09	0.10	0.10	0.12	0.09	0.10
D30 HVAC	5.47	6.87	5.98	17.55	6.03	21.05	30.57	53.73	5.91	7.07	5.57	12.92	6.73	13.35	13.45	6.79	6.44	53.77	9.46	9.90	5.49	6.82	5.64	7.78	6.75
D40 Fire Protection					0.04					0.04		0.26					0.04					0.04		0.26	
D50 Electrical	0.77	0.71	3.98	3.97	0.77	0.73	0.77	6.03	0.77	1.13	0.77	0.75	3.85	6.78	0.77	0.68	0.90	5.90	0.77	0.68	0.77	0.79	3.95	3.93	0.77
E10 Equipment																									
E20 Furnishings																									
F10 Special Construction	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65
F20 Selective Bldg Demolition																									
G10 Site Preparation																									
G20 Site Improvements																									
G30 Site Mechanical Utilities																									
G40 Site Electrical Utilities																									
G90 Other Site Construction																									
Total	**9.12**	**10.53**	**14.72**	**24.42**	**84.61**	**24.93**	**34.98**	**68.18**	**9.60**	**12.40**	**9.23**	**16.81**	**15.24**	**23.04**	**22.94**	**11.78**	**10.32**	**68.25**	**13.13**	**15.13**	**9.18**	**10.58**	**12.57**	**15.11**	**16.32**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 1-25

Based on a 50-Year Forecast.

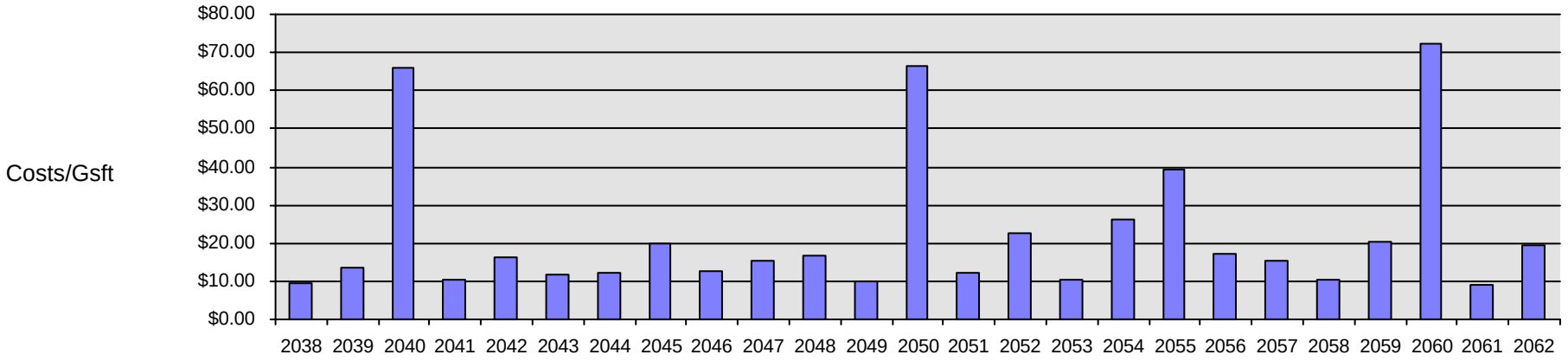
M&R Costs by System per Year Chart

Whitestone Research *04-Jun-15*

Building: Engine Research Building **Facility:** Glenn Research Center **City:** Cleveland, OH

Building Num: 0037 **GSFT:** 7479

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2	**Total**
A10 Foundations																										**0.00**
A20 Basement Construction																										**0.00**
B10 Super Structure										0.02										0.02					0.01	**0.45**
B20 Exterior Enclosure					1.17					1.08					0.01					1.07					0.06	**15.74**
B30 Roofing	0.03	0.03	0.05	0.03	0.03	0.03	0.03	1.81	0.03	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	3.71	0.03	0.03	**12.45**
C10 Interior Construction	0.01		0.22	0.01	0.03		0.01	0.05	0.01	0.18	0.01	0.01	0.22		0.04	0.01	0.01	0.03	0.01	0.17	0.01		0.22	0.01	0.06	**3.56**
C20 Stairs	0.02			0.02	0.59			0.02	0.02	0.04		0.02	0.02		0.00	0.02	0.02			0.06	0.02			0.02	0.19	**2.12**
C30 Interior Finishes			0.08		3.41	0.00		0.00		3.67			0.47		0.00		0.25			3.48			0.25		0.19	**81.44**
D10 Conveying	2.25	2.25	2.25	2.25	2.25	2.25	3.00	5.71	2.25	2.25	2.25	2.25	3.74	2.25	2.25	3.67	2.25	5.30	2.25	2.25	2.25	2.25	2.25	2.25	2.25	**132.92**
D20 Plumbing	0.09	0.10	0.09	0.11	0.09	0.10	0.09	0.12	0.10	0.10	0.09	0.10	0.34	0.09	0.10	0.10	0.10	0.09	0.10	0.09	0.11	0.09	0.12	0.09	0.16	**5.44**
D30 HVAC	5.82	10.04	56.39	6.88	5.95	8.15	7.82	9.15	5.55	5.57	12.87	6.34	54.80	8.34	17.69	5.31	22.51	28.60	7.51	5.72	6.88	16.52	59.65	5.29	13.68	**724.13**
D40 Fire Protection				0.04					0.04		0.26					0.04					0.04		0.26			**1.32**
D50 Electrical	0.68	0.77	6.29	0.77	1.17	0.77	0.71	2.48	4.02	0.90	0.68	0.77	6.12	0.77	0.77	0.77	0.75	4.68	6.71	0.77	0.68	0.77	5.40	0.77	1.13	**101.84**
E10 Equipment																										**0.00**
E20 Furnishings																										**0.00**
F10 Special Construction	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	0.52	0.52	0.52	0.52	1.65	**37.17**
F20 Selective Bldg Demolition																										**0.00**
G10 Site Preparation																										**0.00**
G20 Site Improvements																										**0.00**
G30 Site Mechanical Utilities																										**0.00**
G40 Site Electrical Utilities																										**0.00**
G90 Other Site Construction																										**0.00**
Total	**9.41**	**13.70**	**65.88**	**10.62**	**16.35**	**11.82**	**12.17**	**19.84**	**12.53**	**15.50**	**16.70**	**10.03**	**66.28**	**12.00**	**22.53**	**10.45**	**26.43**	**39.27**	**17.12**	**15.32**	**10.54**	**20.17**	**72.38**	**8.98**	**19.40**	**1118.56**



Notes: A value of "0.00" means cost of more than $.000 but less than $.005 per gsft. All costs expressed in ($) 2012 per gsft. Year 26-50

Based on a 50-Year Forecast.

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
B10 Super Structure																									
Repair Concrete Decking (2% of Decking)																				52					
Finish Repaired Concrete Decking																				2					
Replace Concrete Decking					2,560																				
Finish Replaced Concrete Decking					126																				
Refinish Concrete Decking															126										126
B20 Exterior Enclosure																									
Repair Aluminum Fixed Window, 12 sf, 2nd Floor																									170
Finish Replaced Steel, Painted, Exterior Double Door					53																				
Replace Steel, Painted, Exterior Double Door					2,150																				
Repair Steel, Painted, Exterior Double Door																				380					
Refinish Steel, Painted, Exterior Double Door															53										53
Replace Steel, Painted, Exterior Double Door Locks															349										349
Replace Aluminum Fixed Window, 12 sf, 2nd Floor					2,879																				
Replace Aluminum Fixed Window, 12 sf, 1st Floor					1,707																				
Repair Clay Brick, Exterior, 1st Floor (2% of Walls)																									
Replace Clay Brick, Exterior, 2nd Floor					36,474																				
Clean & Reseal Clay Brick, Exterior, 1st Floor															1,320										1,320
Repoint (50% surface) Clay Brick, Exterior, 2nd Floor																									
Repair Clay Brick, Exterior, 2nd Floor (2% of Walls)																									
Clean & Reseal Clay Brick, Exterior, 2nd Floor															1,900										1,900
Replace Clay Brick, Exterior, 1st Floor					32,853																				
Repoint (50% surface) Clay Brick, Exterior, 1st Floor																									
Repair Aluminum Fixed Window, 12 sf, 1st Floor																									112
Maintain Steel, Painted, Exterior Double Door Locks										23					23					23					23
B30 Roofing																									
Replace Membrane, Built-up Roof																		27,751							
Place New Membrane Over Existing, Built-up Roof			13,126																						
Maintain Built-up Roof	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100
Non-Destructive Moisture Inspection, Built-up Roof			172					172					172										172		
C10 Interior Construction																									
Refinish Steel, Painted, Interior Double Door				62				62				62				62				62				62	
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks			45					45					45					45					45	
Replace Steel, Painted, w/ Safety Glass Interior Door Locks								667										667							
Refinish Steel, Painted, w/ Safety Glass Interior Door		64				64				64				64				64				64			

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
B10 Super Structure																									
Repair Concrete Decking (2% of Decking)										52															52
Finish Repaired Concrete Decking										2															2
Replace Concrete Decking																									
Finish Replaced Concrete Decking																									
Refinish Concrete Decking										126										126					
B20 Exterior Enclosure																									
Repair Aluminum Fixed Window, 12 sf, 2nd Floor																				170					
Finish Replaced Steel, Painted, Exterior Double Door																									
Replace Steel, Painted, Exterior Double Door																									
Repair Steel, Painted, Exterior Double Door										380															380
Refinish Steel, Painted, Exterior Double Door										53										53					
Replace Steel, Painted, Exterior Double Door Locks										349										349					
Replace Aluminum Fixed Window, 12 sf, 2nd Floor																									
Replace Aluminum Fixed Window, 12 sf, 1st Floor																									
Repair Clay Brick, Exterior, 1st Floor (2% of Walls)					657																				
Replace Clay Brick, Exterior, 2nd Floor																									
Clean & Reseal Clay Brick, Exterior, 1st Floor										1,320										1,320					
Repoint (50% surface) Clay Brick, Exterior, 2nd Floor					3,829																				
Repair Clay Brick, Exterior, 2nd Floor (2% of Walls)					729																				
Clean & Reseal Clay Brick, Exterior, 2nd Floor										1,900										1,900					
Replace Clay Brick, Exterior, 1st Floor																									
Repoint (50% surface) Clay Brick, Exterior, 1st Floor					3,482																				
Repair Aluminum Fixed Window, 12 sf, 1st Floor																				112					
Maintain Steel, Painted, Exterior Double Door Locks					23					23					23					23					23
B30 Roofing																									
Replace Membrane, Built-up Roof																						27,751			
Place New Membrane Over Existing, Built-up Roof								13,126																	
Maintain Built-up Roof	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100
Non-Destructive Moisture Inspection, Built-up Roof			172					172					172					172							
C10 Interior Construction																									
Refinish Steel, Painted, Interior Double Door			62				62				62				62				62			62			
Maintain Steel, Painted, w/ Safety Glass Interior Door Locks			45					45					45					45				45			
Replace Steel, Painted, w/ Safety Glass Interior Door Locks			667										667									667			
Refinish Steel, Painted, w/ Safety Glass Interior Door	64				64				64				64				64				64				64

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Steel, Painted, Interior Double Door Locks								334										334							
Maintain Steel, Painted, Interior Double Door Locks			23					23					23					23					23		
Finish Replaced Steel, Painted, Interior Door					95																				
Replace Steel, Painted, Interior Door					8,016																				
Replace Steel, Painted, Interior Door Locks								334							1,001			334							1,001
Maintain Steel, Painted, Interior Door Locks			23					23		68			23		68			23		68			23		68
Refinish Steel, Painted, Interior Door		64		31				31	64			31	64			31	64			31	64			31	64
Refinish Steel, Vault Security, Interior Door		31							31				31				31				31				31
Repair Steel, Vault Security, Interior Door																				192					

C20 Stairs

Finish Replaced Metal, Painted, Interior Stairs					112																				
Finish Repaired Metal, Painted, Interior Railing					3															3					
Replace Metal, Painted, Interior Railing																									
Finish Replaced Metal, Painted, Interior Railing																									
Repair Metal, Painted, Interior Stairs																				237					
Repair Metal, Painted, Interior Railing					181															181					
Replace Metal, Painted, Interior Stairs					3,560																				
Refinish Metal, Painted, Interior Stairs		112							112				112				112				112				112
Repair Concrete, Exterior Stairs					96															96					
Replace Concrete, Exterior Stairs																									
Finish Replaced Metal, Painted, Exterior Railing																				25					
Replace Metal, Painted, Exterior Railing																				1,008					
Finish Repaired Metal, Painted, Exterior Railing					1																				
Repair Metal, Painted, Exterior Railing					37																				
Refinish Metal, Painted, Exterior Railing										27															
Replace Concrete, Interior Stairs					963																				
Repair Concrete, Interior Stairs																									76
Finish Repaired Metal, Painted, Interior Stairs																				3					
Refinish Metal, Painted, Interior Railing		125				125				125				125				125				125			

C30 Interior Finishes

Repair Steel Flooring (2% of Walls)																									
Replace Metal Floor Grating								3,081																	
Repair Metal Floor Grating (2% of Grating)																		137							
Finish Replaced Concrete, Painted Flooring					6,530																				
Replace Concrete, Painted Flooring					65,817																				
Replace Steel Flooring					3,655																				

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Steel, Painted, Interior Double Door Locks			334										334										334		
Maintain Steel, Painted, Interior Double Door Locks			23					23					23					23					23		
Finish Replaced Steel, Painted, Interior Door																									
Replace Steel, Painted, Interior Door																									
Replace Steel, Painted, Interior Door Locks			334							1,001			334							1,001			334		
Maintain Steel, Painted, Interior Door Locks			23		68			23		68			23		68			23		68			23		68
Refinish Steel, Painted, Interior Door			31	64			31	64			31	64			31	64			31	64			31	64	
Refinish Steel, Vault Security, Interior Door				31				31				31				31				31				31	
Repair Steel, Vault Security, Interior Door										192															192
C20 Stairs																									
Finish Replaced Metal, Painted, Interior Stairs																									
Finish Repaired Metal, Painted, Interior Railing																				3					
Replace Metal, Painted, Interior Railing					3,028																				
Finish Replaced Metal, Painted, Interior Railing					125																				
Repair Metal, Painted, Interior Stairs										237															237
Repair Metal, Painted, Interior Railing																				181					
Replace Metal, Painted, Interior Stairs																									
Refinish Metal, Painted, Interior Stairs				112				112				112				112				112				112	
Repair Concrete, Exterior Stairs																				96					
Replace Concrete, Exterior Stairs					1,247																				
Finish Replaced Metal, Painted, Exterior Railing																									25
Replace Metal, Painted, Exterior Railing																									1,008
Finish Repaired Metal, Painted, Exterior Railing										1															
Repair Metal, Painted, Exterior Railing										37															
Refinish Metal, Painted, Exterior Railing					27										27										
Replace Concrete, Interior Stairs																									
Repair Concrete, Interior Stairs																				76					
Finish Repaired Metal, Painted, Interior Stairs										3															3
Refinish Metal, Painted, Interior Railing	125								125				125				125				125				125
C30 Interior Finishes																									
Repair Steel Flooring (2% of Walls)					235																				
Replace Metal Floor Grating													3,081												
Repair Metal Floor Grating (2% of Grating)			137																				137		
Finish Replaced Concrete, Painted Flooring																									
Replace Concrete, Painted Flooring																									
Replace Steel Flooring																									

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Repair Concrete, Painted Flooring (2% of Floors)																				1,317					
Finish Repaired Concrete, Painted Ceiling																									
Finish Repaired Concrete, Painted Flooring																				131					
Repair Vinyl Tile Flooring (2% of Floors)															27										
Replace Vinyl Tile Flooring						1,837																		1,837	
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)					26																	26			
Replace Acoustical Tile, Dropped Ceiling													1,315												
Repair Concrete, Painted Ceiling (2% of Ceiling)																									
Replace Concrete, Painted Ceiling					188,330																				
Finish Replaced Concrete, Painted Ceiling					11,205																				
Refinish Gypsum Board, Interior Wall Finish								433										433							
Refinish Concrete, Painted Flooring															6,530										6,530
Refinish Concrete, Painted Ceiling															11,205										11,205
Repair Concrete Block, Painted, Interior Wall Finish (2% of Wal																									
Finish Repaired Gypsum Board, Interior Wall Finish																		9							
Repair Clay Brick, Interior Wall Finish (2% of Walls)																									
Repoint (50% of surface) Clay Brick, Interior Wall Finish																									
Finish Repaired Clay Brick, Painted, Interior Wall Finish																									
Replace Clay Brick, Interior Wall Finish					38,834																				
Refinish Concrete Block, Painted, Interior Wall Finish															2,588										2,588
Repoint (50% surface) Concrete Block, Painted, Interior Wall Fi																									
Finish Repaired Concrete Block, Painted, Interior Wall Finish																									
Replace Concrete, Painted, Interior Wall Finish					101,578																				
Repair Gypsum Board, Interior Wall Finish (2% of Walls)																		19							
Finish Replaced Clay Brick, Painted, Interior Wall Finish					1,806																				
Finish Replaced Concrete, Painted, Interior Wall Finish					3,907																				
Replace Concrete Block, Painted, Interior Wall Finish					33,759																				
Finish Repaired Concrete, Painted, Interior Wall Finish																									
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)																									
Refinish Concrete, Painted, Interior Wall Finish															3,907										3,907
Finish Replaced Concrete Block, Painted, Interior Wall Finish					2,588																				
Refinish Clay Brick, Painted, Interior Wall Finish															1,806										1,806

D10 Conveying

Maintain Hoist Electric, Overhead, Chain, 5 Ton	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224		224	224	224	224	224	224	224	224	224
Replace Nozzle Block Trolley System								11,486																	
Test & Maintain Hoist Electric, Overhead, Chain, 1/2 Ton	1,011	1,011	1,011	1,011	1,011	1,011		1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011
Test & Maintain Hoist Electric, Overhead, Chain, 1 Ton	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023		2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Repair Concrete, Painted Flooring (2% of Floors)										1,317															1,317
Finish Repaired Concrete, Painted Ceiling					225																				
Finish Repaired Concrete, Painted Flooring										131															131
Repair Vinyl Tile Flooring (2% of Floors)								27																	
Replace Vinyl Tile Flooring																	1,837								
Repair Acoustic Tile, Dropped Ceiling (2% of Ceiling)						26									26										
Replace Acoustical Tile, Dropped Ceiling																							1,315		
Repair Concrete, Painted Ceiling (2% of Ceiling)					3,724																				
Replace Concrete, Painted Ceiling																									
Finish Replaced Concrete, Painted Ceiling																									
Refinish Gypsum Board, Interior Wall Finish			433										433										433		
Refinish Concrete, Painted Flooring										6,530										6,530					
Refinish Concrete, Painted Ceiling										11,205										11,205					
Repair Concrete Block, Painted, Interior Wall Finish (2% of W					675																				
Finish Repaired Gypsum Board, Interior Wall Finish													9												
Repair Clay Brick, Interior Wall Finish (2% of Walls)					777																				
Repoint (50% of surface) Clay Brick, Interior Wall Finish					9,705																				
Finish Repaired Clay Brick, Painted, Interior Wall Finish					36																				
Replace Clay Brick, Interior Wall Finish																									
Refinish Concrete Block, Painted, Interior Wall Finish										2,588										2,588					
Repoint (50% surface) Concrete Block, Painted, Interior Wall					8,017																				
Finish Repaired Concrete Block, Painted, Interior Wall Finish					52																				
Replace Concrete, Painted, Interior Wall Finish																									
Repair Gypsum Board, Interior Wall Finish (2% of Walls)													19												
Finish Replaced Clay Brick, Painted, Interior Wall Finish																									
Finish Replaced Concrete, Painted, Interior Wall Finish																									
Replace Concrete Block, Painted, Interior Wall Finish																									
Finish Repaired Concrete, Painted, Interior Wall Finish					78																				
Repair Concrete, Painted, Interior Wall Finish (2% of Walls)					2,011																				
Refinish Concrete, Painted, Interior Wall Finish										3,907										3,907					
Finish Replaced Concrete Block, Painted, Interior Wall Finish																									
Refinish Clay Brick, Painted, Interior Wall Finish										1,806										1,806					

D10 Conveying

Maintain Hoist Electric, Overhead, Chain, 5 Ton	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224		224	224	224	224	224	224	224	224	224
Replace Nozzle Block Trolley System																		11,486							
Test & Maintain Hoist Electric, Overhead, Chain, 1/2 Ton	1,011	1,011	1,011	1,011	1,011	1,011		1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011
Test & Maintain Hoist Electric, Overhead, Chain, 1 Ton	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023		2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023	2,023

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Hoist Electric, Overhead, Chain, 5 Ton																10,867									
Replace Hoist Electric, Overhead, Chain, 1/2 Ton							7,402																		
Replace Hoist Electric, Overhead, Chain, 1 Ton													14,806												
Maintain Hoist Electric, Overhead, Chain, 1 Ton	894	894	894	894	894	894	894	894	894	894	894	894		894	894	894	894	894	894	894	894	894	894	894	894
Renovate Lift, Hydraulic, Single Post, 2,000 lbs								33,102																	
Maintain Lift, Hydraulic, Single Post, 2,500 lbs	6,151	6,151	6,151	6,151	6,151	6,151	6,151		6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151
Maintain Crane, Jib, Electric, Chain, 1/2 Ton	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961		1,961	1,961	1,961	1,961	1,961	1,961	1,961
Maintain Nozzle Block Trolley System	1,082	1,082	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Maintain Hoist Electric, Overhead, Chain, 1/2 Ton	447	447	447	447	447	447		447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447
Replace Crane, Jib, Electric, 1/2 Ton																		15,164							
D20 Plumbing																									
Replace Roof Drain, 4-6"										564															
Replace 10' Section, Pipe & Fittings, 4" Cast Iron										37												37			
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron																							12		
Replace 10' Section, Pipe & Fittings, 3" Cast Iron		64															64								
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron																									
Maintain Roof Drain, 4-6"	35	35	35	35	35	35	35	35	35		35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Replace 10' Section, Pipe & Fittings, 3/4" Steel		18															18								
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron																							43		
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)					1,274																				
Replace Floor Drain																									
Maintain Floor Drain	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204
Install New Gasket & Bolts, Pipe & Fittings, 3/4" Steel																									
Replace Lavatory, Vitreous China			502																						
Replace Valve Set, Lavatory, Vitreous China													148										148		
Replace Washer & Spud Connection, Lavatory, Vitreous China										46							46							46	
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chin		29			29		29		29		29		29		29		29		29		29		29		29
Replace Pipe & Fittings, 3/4" Steel (20% of Pipe)					367																				
Replace 10' Section, Pipe & Fittings, 3" Cast Iron										106												106			
D30 HVAC																									
Replace Valve Actuator, 2"																									3,573
Lubricate, Repack Gland, Ball Valve, 1"	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82		82	82	82	82	82	82	82	82
Replace Ball Valve, 1"																	828								
Lubricate, Repack Gland, Calibrated Balancing Valve, 2"			41										41												
Replace Calibrated Balancing Valve, 2"																						245			
Maintain Flow Control Valve & Actuator, 1"	648	648	648	540	648	648	648	648	648	648	648	648	648	648	648	648	648	648	432	648	648	648	648	648	648

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Hoist Electric, Overhead, Chain, 5 Ton																10,867									
Replace Hoist Electric, Overhead, Chain, 1/2 Ton							7,402																		
Replace Hoist Electric, Overhead, Chain, 1 Ton													14,806												
Maintain Hoist Electric, Overhead, Chain, 1 Ton	894	894	894	894	894	894	894	894	894	894	894	894		894	894	894	894	894	894	894	894	894	894	894	894
Renovate Lift, Hydraulic, Single Post, 2,000 lbs								33,102																	
Maintain Lift, Hydraulic, Single Post, 2,500 lbs	6,151	6,151	6,151	6,151	6,151	6,151	6,151		6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151
Maintain Crane, Jib, Electric, Chain, 1/2 Ton	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961		1,961	1,961	1,961	1,961	1,961	1,961	1,961
Maintain Nozzle Block Trolley System	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082		1,082	1,082	1,082	1,082	1,082	1,082	1,082
Maintain Hoist Electric, Overhead, Chain, 1/2 Ton	447	447	447	447	447	447		447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447
Replace Crane, Jib, Electric, 1/2 Ton																		15,164							

D20 Plumbing

Replace Roof Drain, 4-6"																									564
Replace 10' Section, Pipe & Fittings, 4" Cast Iron									37												37				
Install New Gasket & Bolts, Pipe & Fittings, 4" Cast Iron																							12		
Replace 10' Section, Pipe & Fittings, 3" Cast Iron				64												64									
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron					26																				
Maintain Roof Drain, 4-6"	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	
Replace 10' Section, Pipe & Fittings, 3/4" Steel				18												18									
Install New Gasket & Bolts, Pipe & Fittings, 3" Cast Iron																							43		
Replace Pipe & Fittings, 3" Cast Iron (20% of Pipe)																									
Replace Floor Drain													1,965												
Maintain Floor Drain	204	204	204	204	204	204	204	204	204	204	204	204		204	204	204	204	204	204	204	204	204	204	204	204
Install New Gasket & Bolts, Pipe & Fittings, 3/4" Steel					15																				
Replace Lavatory, Vitreous China													502												
Replace Valve Set, Lavatory, Vitreous China								148															148		
Replace Washer & Spud Connection, Lavatory, Vitreous Chin						46														46					
Replace Faucet Washer & Clean Trap, Lavatory, Vitreous Chi		29		29		29		29		29		29			29		29		29		29		29		29
Replace Pipe & Fittings, 3/4" Steel (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 3" Cast Iron									106												106				

D30 HVAC

Replace Valve Actuator, 2"																									
Lubricate, Repack Gland, Ball Valve, 1"	82	82	82	82	82	82	82	82		82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
Replace Ball Valve, 1"									828																
Lubricate, Repack Gland, Calibrated Balancing Valve, 2"							41										41								
Replace Calibrated Balancing Valve, 2"																									
Maintain Flow Control Valve & Actuator, 1"	648	648	648	648	648	648	648	648	648	648	324	648	648	648	540	648	648	648	648	648	648	648	648	648	648

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Valve Actuator, 1"															1,238										
Replace Steam Trap, F&T, 1"				1,108								1,108								1,108					
Maintain Flow Control Valve & Actuator, 2"	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel																									
Replace Flow Control Valve, Motorized, 2"																									
Replace Flow Control Valve, Motorized, 4"				3,456																					
Replace Flow Control Valve, Motorized, 1"				555															1,110						
Repair Steam Trap, F&T, 1"		1,273				1,273		1,273		1,273				1,273		1,273		1,273				1,273		1,273	
Maintain Steam Trap, F&T, 1"	132	132	132		132	132	132	132	132	132	132		132	132	132	132	132	132	132		132	132	132	132	132
Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20			579																						
Replace Pipe & Fittings, 1" Steel (20% of Pipe)					1,335																				
Replace 10' Section, Pipe & Fittings, 1" Steel		67															67								
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel								8																	
Replace 10' Section, Pipe & Fittings, 2" Steel							13												13						
Replace Hydraulic Power Unit, 30 Gal.							34,145																		
Repair Hydraulic Power Unit, 30 Gal., Motor		7,874										7,874					7,874					7,874			
Repair Hydraulic Power Unit, 30 Gal.		2,089			2,089					2,089			2,089			2,089			2,089			2,089			2,089
Maintain Hydraulic Power Unit, 30 Gal.	351	351	351	351	351	351		351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351
Replace Valve Actuator, 4"																									
Re-tape Pipe Insulation, Fiberglass, Heating Water/Steam								127					127					127					127		
Repair Air Handler, Single Zone, 1,300 Cfm											2,016														
Replace Exhaust Fan, Roof Mounted, 1,500 Cfm	1,520															1,520									
Repair Exhaust Fan, Roof Mounted, 1,500 Cfm										266															266
Maintain Exhaust Fan, Roof Mounted, 1,500 Cfm		120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	120	120	120	120	120
Replace Existing Ductwork (20% of Ductwork)									902																
Replace Duct Insulation (20% of Insulation)									226																
Replace Air Handler, Single Zone, 8,000 Cfm															21,113										
Repair Air Handler, Single Zone, 8,000 Cfm					2,124																				
Replace 10' Section, Pipe & Fittings, 24" Steel		276		276		552								276		276		552							
Replace Air Handler, Single Zone, 1,300 Cfm																6,967									
Replace Exhaust Fan, Roof Mounted, 5,000 Cfm									2,266															2,266	
Maintain Air Handler, Single Zone, 1,300 Cfm	446	446	446	446	446	446	446	446	446	446	446	446	446	446	446		446	446	446	446	446	446	446	446	446
Replace Pipe & Fittings, 60" Steel (20% of Pipe)																								10,399	
Replace Pipe & Fittings, 24" Steel (20% of Pipe)																									
Replace Pipe & Fittings, 16" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 60" Stainless Steel																									
Install New Gasket & Bolts, Pipe & Fittings, 24" Steel			26					51										26							

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Valve Actuator, 1"							1,858				619														
Replace Steam Trap, F&T, 1"			1,108								1,108								1,108						
Maintain Flow Control Valve & Actuator, 2"	324	324	324		324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel					53																				
Replace Flow Control Valve, Motorized, 2"				5,214																					
Replace Flow Control Valve, Motorized, 4"											6,912				3,456										
Replace Flow Control Valve, Motorized, 1"											1,664				555										
Repair Steam Trap, F&T, 1"	1,273				1,273		1,273		1,273				1,273		1,273		1,273				1,273		1,273		1,273
Maintain Steam Trap, F&T, 1"	132	132		132	132	132	132	132	132	132		132	132	132	132	132	132	132		132	132	132	132	132	132
Replace Pipe Insulation, Fiberglass, Heating Water/Steam (20			579																						
Replace Pipe & Fittings, 1" Steel (20% of Pipe)																									
Replace 10' Section, Pipe & Fittings, 1" Steel				67												67									
Install New Gasket & Bolts, Pipe & Fittings, 2" Steel								8																	
Replace 10' Section, Pipe & Fittings, 2" Steel						13												13							
Replace Hydraulic Power Unit, 30 Gal.		34,145																				34,145			
Repair Hydraulic Power Unit, 30 Gal., Motor							7,874					7,874					7,874								
Repair Hydraulic Power Unit, 30 Gal.					2,089			2,089			2,089			2,089			2,089			2,089					2,089
Maintain Hydraulic Power Unit, 30 Gal.	351		351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351		351	351	351
Replace Valve Actuator, 4"			4,121								2,061														
Re-tape Pipe Insulation, Fiberglass, Heating Water/Steam								127					127					127						127		
Repair Air Handler, Single Zone, 1,300 Cfm		2,016																2,016							
Replace Exhaust Fan, Roof Mounted, 1,500 Cfm						1,520															1,520				
Repair Exhaust Fan, Roof Mounted, 1,500 Cfm															266										
Maintain Exhaust Fan, Roof Mounted, 1,500 Cfm	120	120	120	120	120		120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120
Replace Existing Ductwork (20% of Ductwork)										902															
Replace Duct Insulation (20% of Insulation)										226															
Replace Air Handler, Single Zone, 8,000 Cfm						21,113																21,113			
Repair Air Handler, Single Zone, 8,000 Cfm	2,124																2,124								
Replace 10' Section, Pipe & Fittings, 24" Steel	276		276		552								276		276					552					276
Replace Air Handler, Single Zone, 1,300 Cfm							6,967																6,967		
Replace Exhaust Fan, Roof Mounted, 5,000 Cfm														2,266											
Maintain Air Handler, Single Zone, 1,300 Cfm	446	446	446	446	446	446		446	446	446	446	446	446	446	446	446	446	446	446	446	446	446		446	446
Replace Pipe & Fittings, 60" Steel (20% of Pipe)																									
Replace Pipe & Fittings, 24" Steel (20% of Pipe)								12,491										6,246							
Replace Pipe & Fittings, 16" Steel (20% of Pipe)								4,684																	
Install New Gasket & Bolts, Pipe & Fittings, 60" Stainless Stee																								42	
Install New Gasket & Bolts, Pipe & Fittings, 24" Steel			26																						

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Install New Gasket & Bolts, Pipe & Fittings, 16" Steel								19																	
Replace 10' Section, Pipe & Fittings, 60" Stainless Steel									1,450												1,450				
Maintain Air Handler, Single Zone, 8,000 Cfm	659	659	659	659	659	659	659	659	659	659	659	659	659	659		659	659	659	659	659	659	659	659	659	659
Refinish Steel Damper, Motorized, w/ Actuator													140												
Replace Thermostat			404					1,211		404			404					1,211		404			404		
Maintain Thermostat	145	145	116	145	145	145	145	58	145	116	145	145	116	145	145	145	145	58	145	116	145	145	116	145	145
Replace Direct Digital Controls, System Points								386,450										386,450							
Maintain Flow Control Valve & Actuator, 4"	324	324	324	216	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324
Replace Unit Heater, 12 Mbh												2,283													
Maintain Unit Heater, 12 Mbh	484	484	484	484	484	484	484	484	484	484	484		484	484	484	484	484	484	484	484	484	484	484	484	484
Replace Air Heater, 665 kW															31,555										
Repair Air Heater, 665 kW			972																						
Maintain Exhaust Fan, Roof Mounted, 5,000 Cfm	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123	123	123	123		123
Replace Steel Damper, Motorized, w/ Actuator			2,111																				2,111		
Repair Exhaust Fan, Roof Mounted, 5,000 Cfm			404															404							
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Actu								60					60					60							
Replace Pipe & Fittings, 12" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel			50					33																	
Replace 10' Section, Pipe & Fittings, 12" Steel		238				159								238				159							
Replace Pipe & Fittings, 8" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 8" Steel								25																	
Replace 10' Section, Pipe & Fittings, 8" Steel						60												60							
Repair Unit Heater, 12 Mbh								1,592																	
Maintain Air Heater, 665 kW	635	635	635	635	635	635	635	635	635	635	635	635	635	635		635	635	635	635	635	635	635	635	635	635
Maintain Flow Control Valve, Motorized, 18"	108	108	108	108	108	108	108	108	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Valve Actuator, 12"																									
Replace Actuator, Flow Control Valve, Motorized, 60"																									
Replace Actuator, Flow Control Valve, Motorized, 36"																									
Replace Actuator, Flow Control Valve, Motorized, 24"										9,337															
Replace Actuator, Flow Control Valve, Motorized, 18"																									
Replace Actuator, Flow Control Valve, Motorized, 16"												9,337			9,337										
Maintain Flow Control Valve, Motorized, 60"	108	108	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Replace Flow Control Valve, Motorized, 12"																									
Maintain Flow Control Valve, Motorized, 24"	216	216	216	108	216	216	216	216	216	216	216	216	216	108	216	216	216	216	216	216	216	216	216	216	216
Maintain Flow Control Valve & Actuator, 8"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Maintain Flow Control Valve, Motorized, 16"	324	324	324	216	324	324	324	324	324	324	324	324	324	324	324	324	324	324	216	216	324	324	324	324	324
Maintain Flow Control Valve & Actuator, 12"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Install New Gasket & Bolts, Pipe & Fittings, 16" Steel																									
Replace 10' Section, Pipe & Fittings, 60" Stainless Steel											1,450												1,450		
Maintain Air Handler, Single Zone, 8,000 Cfm	659	659	659	659	659		659	659	659	659	659	659	659	659	659	659	659	659	659	659	659		659	659	659
Refinish Steel Damper, Motorized, w/ Actuator								140																	
Replace Thermostat			1,211		404			404					1,211		404			404					1,211		404
Maintain Thermostat	145	145	58	145	116	145	145	116	145	145	145	145	58	145	116	145	145	116	145	145	145	145	58	145	116
Replace Direct Digital Controls, System Points			386,450										386,450										386,450		
Maintain Flow Control Valve & Actuator, 4"	324	324	324	324	324	324	324	324	324	324	108	324	324	324	216	324	324	324	324	324	324	324	324	324	324
Replace Unit Heater, 12 Mbh																			2,283						
Maintain Unit Heater, 12 Mbh	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484		484	484	484	484	484	484
Replace Air Heater, 665 kW																						31,555			
Repair Air Heater, 665 kW										972															
Maintain Exhaust Fan, Roof Mounted, 5,000 Cfm	123	123	123	123	123	123	123	123	123	123	123	123	123		123	123	123	123	123	123	123	123	123	123	123
Replace Steel Damper, Motorized, w/ Actuator																		2,111							
Repair Exhaust Fan, Roof Mounted, 5,000 Cfm								404															404		
Clean, Lubricate, and Inspect Steel Damper, Motorized, w/ Act			60					60					60										60		
Replace Pipe & Fittings, 12" Steel (20% of Pipe)								3,165																	
Install New Gasket & Bolts, Pipe & Fittings, 12" Steel			50																						
Replace 10' Section, Pipe & Fittings, 12" Steel	238				159								238							159					238
Replace Pipe & Fittings, 8" Steel (20% of Pipe)								1,211																	
Install New Gasket & Bolts, Pipe & Fittings, 8" Steel																									
Replace 10' Section, Pipe & Fittings, 8" Steel					60															60					
Repair Unit Heater, 12 Mbh							1,592																		
Maintain Air Heater, 665 kW	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635		635	635	635
Maintain Flow Control Valve, Motorized, 18"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108		108	108
Replace Valve Actuator, 12"			9,337																						
Replace Actuator, Flow Control Valve, Motorized, 60"													9,337												
Replace Actuator, Flow Control Valve, Motorized, 36"														18,673											
Replace Actuator, Flow Control Valve, Motorized, 24"											9,337										9,337				
Replace Actuator, Flow Control Valve, Motorized, 18"																			9,337						
Replace Actuator, Flow Control Valve, Motorized, 16"											9,337														
Maintain Flow Control Valve, Motorized, 60"	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108		108	108	108	108	108	108	108	108
Replace Flow Control Valve, Motorized, 12"											23,367														
Maintain Flow Control Valve, Motorized, 24"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	108	216	216	216	216	216	216	216	216	216	108
Maintain Flow Control Valve & Actuator, 8"	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Maintain Flow Control Valve, Motorized, 16"	324	324	324	324	324	324	324	324	324	324	324	324	324	324	216	324	324	324	324	324	324	324	324	324	324
Maintain Flow Control Valve & Actuator, 12"	108	108	108	108	108	108	108	108	108	108		108	108	108	108	108	108	108	108	108	108	108	108	108	108

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Flow Control Valve, Motorized, 8"																									
Replace Valve Actuator, 8"																									5,044
Replace Flow Control Valve, Motorized, 6"												5,055												5,055	
Maintain Flow Control Valve & Actuator, 6"	216	216	216	216	216	216	216	216	216	216	216	108	216	216	216	216	216	216	216	216	216	216	216	108	216
Replace 10' Section, Pipe & Fittings, 16" Steel						234												234							
Monitor Direct Digital Controls, System Points	16,074	16,074	16,074	16,074	16,074	16,074	16,074		16,074	16,074	16,074	16,074	16,074	16,074	16,074	16,074	16,074		16,074	16,074	16,074	16,074	16,074	16,074	16,074
Maintain Flow Control Valve, Motorized, 36"	216	216	216	216	216	216		216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
Replace Gate Valve, 2-3"			581															581							
Replace Gate Valve, 12"													7,876												
Replace Valve Actuator, 6"																				4,895					
Replace Flow Control Valve, Motorized, 16"				28,535															28,535	28,535					
Air Filters, Cartridge	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221
Repack Gland, Gate Valve, 12"						63															63				
Repack Gland, Gate Valve, 2-3"											63														
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of Ins								96																	
Re-tape Pipe Insulation, Fiberglass, Chilled Water			28										28					28					28		
Replace Pipe & Fittings, 6" Steel (20% of Pipe)																									
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel								49																	
Replace 10' Section, Pipe & Fittings, 1" Steel							19												19						
Replace Flow Control Valve, Motorized, 36"							155,907																		
Replace 10' Section, Pipe & Fittings, 6" Steel						95												95							
Replace Flow Control Valve, Motorized, 24"				58,719										58,719											
Replace Flow Control Valve, Motorized, 60"						115,581																			
Replace Flow Control Valve, Motorized, 18"												32,747													
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel								15																	
Replace 10' Section, Pipe & Fittings, 4" Steel						77												77							
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel								37																	
Replace Pipe & Fittings, 4" Steel (20% of Pipe)																									

D40 Fire Protection

Replace Fire Extinguisher												1,914												1,914	
Inspect & Test Fire Extinguisher					208					208							208					208			

D50 Electrical

Replace Oxygen Monitoring System													3,599												
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150								116					116					116							
Maintain Camera, Interior, Closed Circuit, PTZ Color	454	454	454		454	454	454	454	454	454	454	454	454		454	454	454	454	454	454	454	454	454		454
Repair Oxygen Monitoring System								59															59		

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Flow Control Valve, Motorized, 8"				7,302																					
Replace Valve Actuator, 8"																									
Replace Flow Control Valve, Motorized, 6"																							5,055		
Maintain Flow Control Valve & Actuator, 6"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	108	216	216
Replace 10' Section, Pipe & Fittings, 16" Steel					234															234					
Monitor Direct Digital Controls, System Points	16,074	16,074		16,074	16,074	16,074	16,074	16,074	16,074	16,074	16,074	16,074		16,074	16,074	16,074	16,074	16,074	16,074	16,074	16,074	16,074		16,074	16,074
Maintain Flow Control Valve, Motorized, 36"	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216		216	216	216	216	216	216	216
Replace Gate Valve, 2-3"								581															581		
Replace Gate Valve, 12"			7,876															7,876							
Replace Valve Actuator, 6"																			4,895						
Replace Flow Control Valve, Motorized, 16"															28,535										
Air Filters, Cartridge	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221
Repack Gland, Gate Valve, 12"											63														
Repack Gland, Gate Valve, 2-3"	63															63									
Replace Pipe Insulation, Fiberglass, Chilled Water (20% of In								96																	
Re-tape Pipe Insulation, Fiberglass, Chilled Water			28										28					28					28		
Replace Pipe & Fittings, 6" Steel (20% of Pipe)								1,921																	
Install New Gasket & Bolts, Pipe & Fittings, 6" Steel																									
Replace 10' Section, Pipe & Fittings, 1" Steel						19												19							
Replace Flow Control Valve, Motorized, 36"																		155,907							
Replace 10' Section, Pipe & Fittings, 6" Steel					95															95					
Replace Flow Control Valve, Motorized, 24"															58,719										58,719
Replace Flow Control Valve, Motorized, 60"																	115,581								
Replace Flow Control Valve, Motorized, 18"																							32,747		
Install New Gasket & Bolts, Pipe & Fittings, 1" Steel								15																	
Replace 10' Section, Pipe & Fittings, 4" Steel					77															77					
Install New Gasket & Bolts, Pipe & Fittings, 4" Steel																									
Replace Pipe & Fittings, 4" Steel (20% of Pipe)								1,528																	
D40 Fire Protection																									
Replace Fire Extinguisher											1,914												1,914		
Inspect & Test Fire Extinguisher				208					208							208					208				
D50 Electrical																									
Replace Oxygen Monitoring System			3,599															3,599							
Replace Lamp, Metal Halide Lighting Fixture, Wall Mount, 150			116					116					116										116		
Maintain Camera, Interior, Closed Circuit, PTZ Color	454	454	454	454	454	454	454	454		454	454	454	454	454	454	454	454	454		454	454	454	454	454	454
Repair Oxygen Monitoring System													59												

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Replace Batteries & Check Operation, Oxygen Monitoring Syst	23	23	23	23	23	23	23	23	23	23	23	23		23	23	23	23	23	23	23	23	23	23	23	23
Replace Wiring Device, Switch													1,587												
Repair Wiring Device, Switch			1,690																				1,690		
Replace Receptacle, 208 V, 3 phase										1,428			1,428												
Replace Receptacle, 120 V, 15 Amp.										1,891			2,701												
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w			197					197					197										197		
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 150													228												
Replace Incandescent Lighting Fixture, Basic, 100 w																		2,489							
Replace Monitor, Small, Closed Circuit								17,957										17,957							
Replace HP Sodium Lighting Fixture, 250 w			11,979																				11,979		
Replace Ballast & Lamp, HP Sodium Lighting Fixture, 250 w													4,291												
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w			570																				570		
Replace Heat Detector			364															364							
Replace Security System Panel				503										503										503	
Repair Disconnect Switch, 400 Amp.																		299							
Replace Fluorescent Lighting Fixture, T12, 2-40 w																		6,017							
Maintain Security System Panel		91						91				91						91				91			
Replace Public Address Speaker													2,347												
Maintain Public Address Speaker	210	210	210	210	210	210	210	210	210	210	210	210		210	210	210	210	210	210	210	210	210	210	210	210
Maintain Intrusion Detection Motion Detector, Interior	227	227	227		227	227	227	227	227	227	227	227	227		227	227	227	227	227	227	227	227	227		227
Replace Intrusion Detection Motion Detector, Interior				3,484										3,484										3,484	
Replace Camera, Interior, Closed Circuit, PTZ Color				15,931										15,931										15,931	
Repair Heat Detector													124												
Check Operation, Heat Detector	59	59		59	59	59	59	59	59	59	59	59	59	59	59	59	59		59	59	59	59	59	59	59
Replace Fire Alarm Horn & Strobe														532											
Replace Electric Lock				982										982										982	
Replace Access Card Reader w/ Keypad				3,735										3,735										3,735	
Maintain Card Reader w/ Keypad	272	272	272		272	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272		272
Replace Monitor, Large, Closed Circuit								10,228										10,228							
Maintain Disconnect Switch, 30 Amp.	211	211	211	211	211	211	211	211	211	211	211	211	91	211	211	211	211	211	211	211	211	211	211	211	211
Replace Disconnect Switch, 400 Amp.								4,451																	
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 2-								3,651																	
Replace Disconnect Switch, 60 Amp.								1,741																	
Inspect & Clean Motor Starter, <5HP, <600V	242	242	242	121	242	181	242	242	242	242	242	181	242	242	242	242	242	242	242	242	242	121	242	181	242
Maintain Disconnect Switch, 60 Amp.	59	59	59	59	59	59	59		59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
Replace Coil, Motor Starter, <5HP, <600V	526		527			264	526		527	526		264	526		527	526		527	526		527			264	526
Repair Disconnect Switch, 30 Amp.			934	187				187					187	187				187					934	187	

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Replace Batteries & Check Operation, Oxygen Monitoring Sys	23	23		23	23	23	23	23	23	23	23	23	23	23	23	23	23		23	23	23	23	23	23	23
Replace Wiring Device, Switch			1,587															1,587							
Repair Wiring Device, Switch													1,690												
Replace Receptacle, 208 V, 3 phase					1,428			1,428																	1,428
Replace Receptacle, 120 V, 15 Amp.					1,891			2,701																	1,891
Replace Lamp, Incandescent Lighting Fixture, Basic, 100 w			197					197										197					197		
Replace Ballast, Metal Halide Lighting Fixture, Wall Mount, 15								228																	
Replace Incandescent Lighting Fixture, Basic, 100 w													2,489												
Replace Monitor, Small, Closed Circuit			17,957										17,957										17,957		
Replace HP Sodium Lighting Fixture, 250 w																		11,979							
Replace Ballast & Lamp, HP Sodium Lighting Fixture, 250 w								4,291																	
Replace Metal Halide Lighting Fixture, Wall Mount, 150 w																		570							
Replace Heat Detector								364															364		
Replace Security System Panel									503										503						
Repair Disconnect Switch, 400 Amp.			299										299										299		
Replace Fluorescent Lighting Fixture, T12, 2-40 w													6,017												
Maintain Security System Panel			91				91						91				91						91		
Replace Public Address Speaker			2,347															2,347							
Maintain Public Address Speaker	210	210		210	210	210	210	210	210	210	210	210	210	210	210	210	210		210	210	210	210	210	210	210
Maintain Intrusion Detection Motion Detector, Interior	227	227	227	227	227	227	227	227		227	227	227	227	227	227	227	227	227		227	227	227	227	227	227
Replace Intrusion Detection Motion Detector, Interior									3,484										3,484						
Replace Camera, Interior, Closed Circuit, PTZ Color									15,931										15,931						
Repair Heat Detector			124															124							
Check Operation, Heat Detector	59	59	59	59	59	59	59		59	59	59	59	59	59	59	59	59	59	59	59	59	59		59	59
Replace Fire Alarm Horn & Strobe									532																
Replace Electric Lock									982										982						
Replace Access Card Reader w/ Keypad									3,735										3,735						
Maintain Card Reader w/ Keypad	272	272	272	272	272	272	272	272		272	272	272	272	272	272	272	272	272		272	272	272	272	272	272
Replace Monitor, Large, Closed Circuit			10,228										10,228										10,228		
Maintain Disconnect Switch, 30 Amp.	211	211	211	211	211	211	211	180	180	211	211	211	180	211	211	211	211	211	211	211	211	211	211	211	211
Replace Disconnect Switch, 400 Amp.																									
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T12, 2			3,651																				3,651		
Replace Disconnect Switch, 60 Amp.																									
Inspect & Clean Motor Starter, <5HP, <600V	242	242	242	242	181	242	242	242	242	242	242	242	242	242	121	242	181	242	242	242	242	242	181	242	242
Maintain Disconnect Switch, 60 Amp.	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
Replace Coil, Motor Starter, <5HP, <600V		527	526		264	526		527	526		527	526		527			264	526		527	526		264	526	
Repair Disconnect Switch, 30 Amp.			187					747										934	187				187		

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

Forecast Year:	2013	4	5	6	7	2018	9	0	1	2	2023	4	5	6	7	2028	9	0	1	2	2033	4	5	6	7
Maintain Disconnect Switch, 400 Amp.	84	84	84	84	84	84	84		84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Replace Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.																									
Repair Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.				502										502										502	
Maintain Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
Replace Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.													5,004												
Repair Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.			2,011																				2,011		
Maintain Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.	145	145	145	145	145	145	145	145	145	145	145	145		145	145	145	145	145	145	145	145	145	145	145	145
Replace Disconnect Switch, 30 Amp.													1,751												
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/ B	476				476		476		476		476		476		476		476		476		476				476
Replace Fluorescent Lighting Fixture, T8, 2-32 w								1,359																	
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-3																		867							
Repair Disconnect Switch, 60 Amp.																		380							
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/ Ba													253												
Replace Motor Starter, <5HP, <600V				1,405		703						703										1,405		703	
Replace Power Panel Board, 208 Y/120 V, 400 Amp.														8,240											
Repair Power Panel Board, 208 Y/120 V, 400 Amp.				143																				143	
Maintain Power Panel Board, 208 Y/120 V, 400 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91	91	91	91	91	91
Replace Power Panel Board, 208 Y/120 V, 225 Amp.														13,830											
Repair Power Panel Board, 208 Y/120 V, 225 Amp.				285																				285	
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181		181	181	181	181	181	181	181	181	181	181	181
Replace Motor Starter, 5-20 HP, <600 V																	1,719								
Replace Coil, Motor Starter, 5-20 HP, <600 V		526			526			526			526			526						526			526		
Inspect & Clean Motor Starter, 5-20 HP, <600 V	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121		121	121	121	121	121	121	121	121
Replace Emergency Lighting Pack, 2 Light w/ Battery			6,881																				6,881		
F10 Special Construction																									
In-service Inspection Engineering, 1x1 Pressure Certification					1,229					1,229					1,229					1,229					1,229
Recertification Engineering, 1x1 Pressure Certification					3,950					3,950					3,950					3,950					3,950
Calibrate 1x1 Tunnel Controls	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Cycle 1x1 Tunnel Valves	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
Recertification Technician, 1x1 Pressure Certification					2,267					2,267					2,267					2,267					2,267
In-service Inspection Technician, 1x1 Pressure Certification					1,045					1,045					1,045					1,045					1,045

Building: Engine Research Building **Facility:** Glenn Research Center

Building Num: 0037 **City:** Cleveland, OH

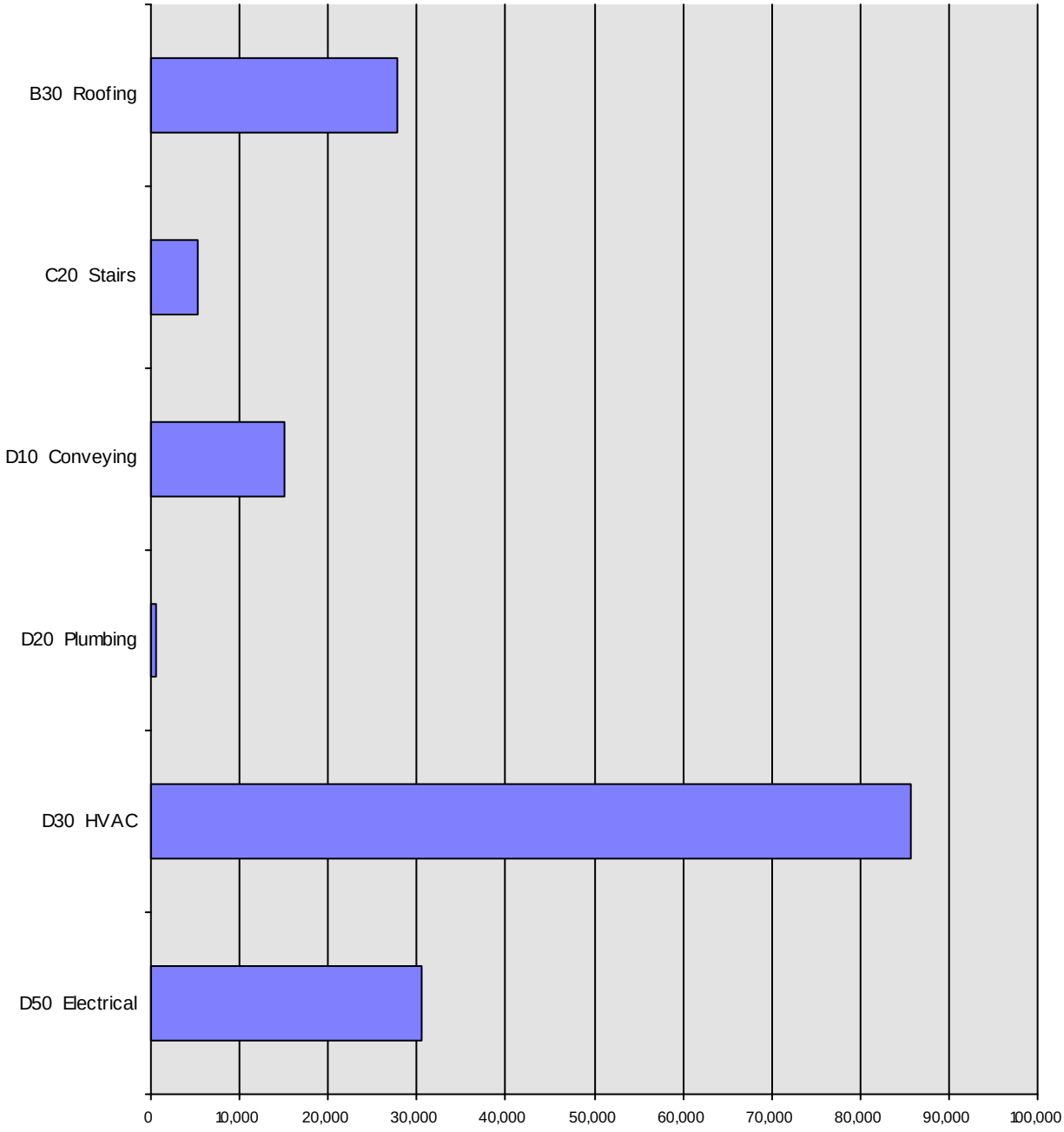
Forecast Year:	2038	9	0	1	2	2043	4	5	6	7	2048	9	0	1	2	2053	4	5	6	7	2058	9	0	1	2
Maintain Disconnect Switch, 400 Amp.	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Replace Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.									848																
Repair Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.																			502						
Maintain Circuit Breaker, Main, 240 V, 15-60 Amp., 3 Ph.	37	37	37	37	37	37	37	37		37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
Replace Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.																									
Repair Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.								2,011										2,011							
Maintain Circuit Breaker, 600 V, 30-60 Amp., 3 Ph.	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Replace Disconnect Switch, 30 Amp.								437	437				437												
Replace Lamp, Replace Emergency Lighting Pack, 2 Light w/		476		476		476		476		476		476		476		476				476		476		476	
Replace Fluorescent Lighting Fixture, T8, 2-32 w			1,359																				1,359		
Replace Ballast & Lamps, Fluorescent Lighting Fixture, T8, 2-													867												
Repair Disconnect Switch, 60 Amp.			380										380										380		
Replace Lens, Replace Emergency Lighting Pack, 2 Light w/								253																	
Replace Motor Starter, <5HP, <600V					703										1,405		703						703		
Replace Power Panel Board, 208 Y/120 V, 400 Amp.																			8,240						
Repair Power Panel Board, 208 Y/120 V, 400 Amp.									143																
Maintain Power Panel Board, 208 Y/120 V, 400 Amp.	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91		91	91	91	91	91	91
Replace Power Panel Board, 208 Y/120 V, 225 Amp.																			13,830						
Repair Power Panel Board, 208 Y/120 V, 225 Amp.									285																
Maintain Power Panel Board, 208 Y/120 V, 225 Amp.	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181		181	181	181	181	181	181
Replace Motor Starter, 5-20 HP, <600 V										1,719															
Replace Coil, Motor Starter, 5-20 HP, <600 V	526			526			526						526			526			526				526		526
Inspect & Clean Motor Starter, 5-20 HP, <600 V	121	121	121	121	121	121	121	121	121		121	121	121	121	121	121	121	121	121	121	121	121	121	121	121
Replace Emergency Lighting Pack, 2 Light w/ Battery																		6,881							

F10 Special Construction

In-service Inspection Engineering, 1x1 Pressure Certification					1,229					1,229					1,229					1,229					1,229
Recertification Engineering, 1x1 Pressure Certification					3,950					3,950					3,950					3,950					3,950
Calibrate 1x1 Tunnel Controls	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
Cycle 1x1 Tunnel Valves	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
Recertification Technician, 1x1 Pressure Certification					2,267					2,267					2,267					2,267					2,267
In-service Inspection Technician, 1x1 Pressure Certification					1,045					1,045					1,045					1,045					1,045

Building Deferred Maintenance by System Chart

Building: Engine Research Building **Building Num:** 0037



All costs expressed in ($) 2012. Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral and is included in Total Deferred Maintenance.

Based on a 50-Year Forecast.

Building Deferred Maintenance Detail

Whitestone Research

Building: Engine Research Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1942
Original Cost: $1
Replacement Value: $6,608,331
per SF: $884

Building Type: Central Plant, Chilled Water
Building Gsft: 7,479
Building Number: 0037

Year Installed	Years Deferred	Deferred Maintenance Task*	Deferred* Maintenance	Degradation Cost**	Total Deferred Maintenance
1960	17	Replace Flow Control Valve, Motorized, 16"	$28,535	$0	$28,535
1970	13	Replace Membrane, Built-up Roof	$27,751	$0	$27,751
1976	1	Replace Flow Control Valve, Motorized, 12"	$23,367	$0	$23,367
1995	2	Replace Air Handler, Single Zone, 8,000 Cfm	$21,113	$0	$21,113
1980	8	Replace Crane, Jib, Electric, 1/2 Ton	$15,164	$0	$15,164
1976	1	Replace Flow Control Valve, Motorized, 4"	$6,912	$0	$6,912
1975	18	Replace Emergency Lighting Pack, 2 Light w/ Battery	$6,881	$0	$6,881
1970	23	Replace Fluorescent Lighting Fixture, T12, 2-40 w	$6,017	$0	$6,017
1942	21	Replace Metal, Painted, Interior Railing	$3,028	$0	$3,028
1965	28	Replace Receptacle, 120 V, 15 Amp.	$2,701	$0	$2,701
1970	23	Replace Incandescent Lighting Fixture, Basic, 100 w	$2,489	$0	$2,489
1980	18	Replace Public Address Speaker	$2,347	$0	$2,347
1960	21	Replace Unit Heater, 12 Mbh	$2,283	$0	$2,283
1942	51	Replace Receptacle, 120 V, 15 Amp.	$1,891	$0	$1,891
1975	20	Replace Motor Starter, 5-20 HP, <600 V	$1,719	$0	$1,719
1965	28	Replace Receptacle, 208 V, 3 phase	$1,428	$0	$1,428
1942	51	Replace Receptacle, 208 V, 3 phase	$1,428	$0	$1,428
1980	15	Replace Motor Starter, <5HP, <600V	$1,405	$0	$1,405
1942	21	Replace Concrete, Exterior Stairs	$1,247	$0	$1,247
1980	23	Replace Thermostat	$1,211	$0	$1,211
1965	33	Replace Wiring Device, Switch	$1,133	$0	$1,133
1960	45	Replace Steam Trap, F&T, 1"	$1,108	$0	$1,108
1942	41	Replace Metal, Painted, Exterior Railing	$1,008	$0	$1,008
1995	1	Replace Ball Valve, 1"	$828	$0	$828
1970	25	Replace Motor Starter, <5HP, <600V	$703	$0	$703
1942	31	Replace Roof Drain, 4-6"	$564	$0	$564
1995	3	Replace Wiring Device, Switch	$454	$0	$454
1995	8	Replace Thermostat	$404	$0	$404
		Total	**$165,118**	**$0**	**$165,118**

All costs expressed in ($) 2012.

Forecast Year: 2013

*Deferred Maintenance is defined as the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime as of the Forecast Year. Preventative maintenance and minor repairs are not included.

**Degradation Cost is defined as additional cost (penalty cost) incurred by maintenance deferral.

Based on a 50-Year Forecast.

Building Operations Task Details

Whitestone Research

Building: Engine Research Building **Year Built:** 1942 **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center **Original Cost:** $1 **Building Num:** 0037

City: Cleveland, OH **Replacement Value:** $6,608,331 **per SF:** $884 **Building Gsft:** 7,479

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Operation: Custodial		**Level of Service: Low**			
Mechanical/Equipment	6731	Sweep Hard Floor with 48" Push Broom	$139	$23	$161
Mechanical/Equipment	6731	Empty Trash; Wipe Clean & Re-line Basket	$89	$14	$103
Shop	373	Damp Mop Hard Floors with 24 oz. Mop Head Using Double Bucket & Wringer	$156	$25	$182
Computer Room	373	Damp Wipe Surfaces with Trigger Sprayer & Cloth	$63	$10	$73
Shop	373	Empty Trash; Wipe Clean & Re-line Basket	$59	$10	$69
Computer Room	373	Wet Mop & Rinse Hard Floor with 32 oz. Mop Using Double Bucket & Wringer	$49	$8	$57
Computer Room	373	Sweep Hard Floor with 36" Push Broom	$36	$6	$42
Computer Room	373	Empty Trash; Wipe Clean & Re-line Basket	$21	$3	$25
Total:			**$613**	**$100**	**$713**
Operation: Grounds		**Level of Service: Medium**			
Grounds, Improved	4487	Mow Turfgrass with 21" Power Mower	$262	$109	$371
Grounds, Improved	4487	Aerate Improved Grounds	$239	$99	$338
Grounds, Improved	4487	Clear Shrubs	$159	$66	$226
Grounds, Improved	4487	Overseed, Improved Grounds	$119	$50	$169
Grounds, Improved	4487	Edge Clean & Trim Walks with Gas Powered Edger	$100	$42	$142
Grounds, Improved	4487	Vacuum with 30" Billy Goat	$80	$33	$113
Grounds, Improved	4487	Clear Crabgrass	$60	$25	$84
Grounds, Improved	4487	Clear Weeds with 15" Boom, Improved Grounds	$32	$13	$45
Grounds, Improved	4487	Fertilize Improved Grounds	$24	$10	$34
Grounds, Improved	4487	Trim Around Raised Objects with String Edger	$21	$9	$29
Grounds, Improved	4487	Sweep with 30" Power Rake	$16	$7	$22
Grounds, Improved	4487	Fertilize Using Power Take Off Broadcast	$0	$0	$0
Total:			**$1,110**	**$462**	**$1,572**
Operation: Pest Control		**Level of Service: Medium**			
Pest Controlled	7479	Install, or Check and Re-Bait 5 Rodent Boxes	$203	$85	$288
Pest Controlled	7479	Perform Crawling Insect Abatement	$153	$64	$216

Functional Area	FA GSFT	Task	Labor Cost	Material Cost	Task Cost
Pest Controlled	7479	Inspect Building for Pests	$85	$0	$85
Total:			**$441**	**$148**	**$589**
Operation: Road Clearance		**Level of Service: Medium**			
Pavement NASA	5983	Plow Paved Area	$460	$139	$599
Total:			**$460**	**$139**	**$599**
Operation: Security		**Level of Service: Medium**			
Secured Area	7479	Patrol Building Perimeter	$1,265	$205	$1,470
Secured Area	7479	Guard Lobby/Parking	$0	$0	$0
Total:			**$1,265**	**$205**	**$1,470**

Building Operations Service Details

Whitestone Research

Building: Engine Research Building | **Year Built:** 1942 | **FTEs:** 8 | **Building Type:** Central Plant, Chilled Wate

Facility: Glenn Research Center | **Original Cost:** $1 | **Building Num:** 0037

City: Cleveland, OH | **Replacement Value:** $6,608,331 | **per SF:** $884 | **Building Gsft:** 7,479

	Service*	Quantity	Rate	Cost
Operation: Security	**Level of Service: Medium**			
	Intrusion Detection Systems	1	$4,986	$4,986
	System Monitoring	1	$3,615	$3,615
	Access Control	1	$2,690	$2,690
	Total:			**$11,291**
Operation: Telecom	**Level of Service: High**			
	Local Telephone	8	$468	$3,744
	Data	8	$3,588	$1,923
	Long Distance Telephone	8	$192	$1,536
	Total:			**$7,203**

All costs expressed in ($) 2012.

18-Dec-14

* Secutity may be composed of service and task based cost. See Building Operations Task Details for Security Tasks.

Building Operations Management Details

Whitestone Research

Building: Engine Research Building
Facility: Glenn Research Center
City: Cleveland, OH

Year Built: 1942
Original Cost: $1
Replacement Value: $6,608,331 **per SF:** $884

Building Type: Central Plant, Chilled Wate
Building Num: 0037
Building Gsft: 7,479

	Service	Demand	UM	PRV	Cost
Operation: Management	**Level of Service: Low**				
	Management	0.3%	PRV	$6,608,331	$16,521
	Total:				**$16,521**