2006: Newly completed Biomedical Sciences Research Building
Introduction

Fiscal Year 2006 continued as both a year of continuing department budget cuts and aggressive campus growth in buildings maintained by the General Fund. For the second consecutive year over the last five years, Facilities Maintenance (FM) as a whole barely missed balancing these cuts with the growing service requests and growing maintenance needs of this institution. This fiscal information is discussed further within this report as well as the other program and department accomplishments from our various shops.

Facilities Maintenance Organization Chart
FY 06 Financial Summary for Facilities Maintenance

Yearly Financials
Facilities Maintenance (FM) finished Fiscal Year ’06 with a General Fund (GF) margin of ($332,334). On the $25,530,739 GF budget allocated to FM overall, this represented (1.3%).

On the brighter side, the FM Enterprise completed $42.5 million in work, finishing with a positive balance of $1,226,659 after covering the above mentioned GF losses. This represented outstanding progress within FY 06 towards our allowable 5% budget reserve of $2.13 million. Our Auxiliary rebilling revenue increased an incredible 14.4% this year on top of the 4.7% increase of FY05 and a (.03%) rescission in FY 04. Our average enterprise monthly billing rose $400,000 to $3.5 million. In June ’06 we billed our largest month ever, $5.2 million.

General Fund work made up 56% of our billing in FY06,

• The Hospital Maintenance contract started the year with a negative margin of ($583,000) and finished with improvement to a negative ($295,584). The Hospital contract is roughly $11.8 million annually and the present balance represents the entire 9 year life of the contract. As a process, capital project based true-ups with the Hospital have been completed post FY end, therefore an effort will be made in FY 07 to complete the true-up process within the end of the fiscal year window.

• We continued to work with ISES to define our operational costs at an APPA Gold Level of service for our new World-Class buildings. In addition, we are “stepping out” on developing identical service report relationships with other knowledgeable facilities consultants. For a third consecutive year we identified the collective net addition of building systems (coined “Phantom Building”) to our existing campus buildings supported by the General Fund. We were successful and appreciative in seeing $52,354 in support for these new systems being added to our budget for FY 07.

• We were supported in FY 05 with a positive business initiative decision to address our future manpower needs through the second year continuation (FY07) in funding of $300,000 to increase our apprenticeship ranks. This is an annual investment for four years addressing the projected attrition of our Trades staffing.

• We made substantial fiscal progress this year through the Physical Properties Infrastructure (PPI) and Infrastructure Maintenance Fee’s (IMF) programs. Two notables: an additional $265,000 was allotted to address FM maintenance needs above the $20,000 operational budget threshold and, an additional $400,000 was identified to address replacement needs for variable frequency drives (VFD’s), across campus. In FY07, approximately $392,000 in PPI for operational budget threshold is anticipated.

• Budget cuts for FY07 are being distributed in the amount of $189,741.

• Net new space funding gained for FY07 will be $1,327,816.
Year-End Operational Highlights

FM Campus Programs

- The highlight of FY 06 has to be the winning of the APPA Facilities Award. The Award for Excellence is APPA's highest institutional honor and provides educational institutions the opportunity for national and international recognition for their outstanding achievements in facilities management. The award is designed to highlight the essential role of facilities operations in the overall institutional mission and vision. The physical receipt of this award symbolizes the time, efforts, and contributions of all FM staff as we worked constantly on improvements to our institution and customers through the Vision 2005 strategic plan.
- We continued to work towards the establishment of Service Level Agreements (SLA’s). Most recently we are tailoring one to service the MCIT Parallel Computing Center at the Arbor Lakes complex.
- In FY05/06 we participated in the B&F Survey for both employee’s and customers. FM continues to make progress on several suggestions from our employee base. A very large effort was extended this year to embrace the results of the B&F customer survey. This included meetings across campus with our customers resulting in a matrix of process and communications improvements centering on customer service. The efforts are a mid term (1-2 year) improvement plan inclusive of renewed FM focused customer service scenario’s. To “hit home” with our work force, these training examples are based on our own real life customer situations and complexities as analyzed by a third party. Full staff training is anticipated to be completed within the months of October through November.
- FM participated in renewed planning efforts with our peer departments in Plant Operations as we engaged in our strategic planning for the next five years, Vision 2012.
- The City of Ann Arbor changed to automated meter reading for each and every one of our buildings’ water systems. This was a large undertaking with a lot of coordination required with a very successful project completion. The Plumbing Shop and Ed Schaedig worked together to keep our customers and the City mutually happy.
- All Weld Shop staff earned AWS (American Welding Society) structural welding certifications this year in areas they were not previously certified for. This was a staff driven training issue listed in their business plan goals.
- The hospital elevator maintenance contract was renegotiated with Otis Elevator. A three year agreement with two extensions of one year each was inkey. A 3% annual savings was agreed to in exchange for annual up front payments tied to performance requirements for the equipment. This is a win-win contract for all.
- At the Hospital, the annual fire safety inspection was conducted during May 1 – 5, 2006. The Inspector General’s comment was: “Overall the facility is in excellent condition. The hospital has made significant progress in correcting and preventing further fire safety violations, including, fire wall penetrations”.
- The Hospital Maintenance group added a new Foremans position to the ENWAH shift allowing 24hr Mon-Fri management coverage, and a soon to hire Planner/Scheduler.
- Our BAS group continues to literally add thousands of monitored points annually. They also continued with “Continuous Commissioning” a program that systematically checks the performance of our buildings systems on a recurring basis.
• Emergency support crews responded to several emergencies this year, one notable event was a water main break on North Campus. The event occurred during bitter cold freezing weather and a multi-department group of employee’s worked late night/early morning to provide repairs; a testament to our staff’s dedication of supporting the University.
• We established two new geographically located Zones embracing new physical core research and academic expansions of the University. This has been a long term vision to establish one additional Zone group specific to the service needs of the research community, and the second on North Campus. We are in the process of filling the research zones supervisory position.
• This year is the second consecutive year that the overall number of corrective work orders for the Zones has been reduced. Considering the number of new buildings and additional square footage we are maintaining, it is evident the preventive maintenance (PM) program is working. We simply are not experiencing the types of unscheduled failures we have in the past. This year we also improved the percentage of PM completions, in nearly every Zone.
• The Air Conditioning Shop’s strategic reorganization initiative was completed in FY ‘06. The reorganization established shops dedicated to: HVA/C Controls and Energy Conservation, Refrigeration, Chiller Systems, and Temperature Control and Air Balance.
• We have sent many staff within the central electrical shops to training in a wide variety of areas such as chillers, variable frequency drives, portable generators, and uninterruptible power supplies.
• FM staffing is at 433 FTE
• General Fund support hours 358,866, up from 339,418.
• Average labor hour rate $58.82, up from $57.81
• Material cost/billed labor hour $13.55, up from $13.05

Notable Challenges for FY07
• Campus resources to support our many code deficient programs such as fire alarm and systems testing, refrigerant compliance, spill prevention containment, and a definitive arc-flash program with corresponding safety training.
• Research related equipment and systems support for fume hood and exhaust systems, high purity water systems, cold rooms and refrigeration, vacuum and lab gas support, secondary electrical systems for generator and uninterruptible power supply systems.
• Activation of three Hospital buildings under construction and continued support planning for the new 1.1 million SF Women’s and Children’s Hospital.
• Pandemic planning for the department and Plant Operations as a whole.
• Increased marks for both Customer and Employee satisfaction as measured through B&F’s second survey.
• Additional financial apprenticeship support, (above and beyond the much appreciated present $300,000), to address the 2012/13/14 skilled trades & P&A retirement projections.
• We are working now to define a new Zone in the Business School area with the completion of Weil Hall eminent, an addition to the Art Museum, replacement of a majority of the Stephen M. Ross Business School, and pending Law School changes.
It takes two screens to effectively monitor campus buildings.
Shown here is Joe Circoloff, BAS Utility Systems Technician II.
Section I: Introduction

Building Automation Services (BAS) grew by a robust 20% in FY’06 due to new building construction and ongoing renovations. Improved communications and efficiencies gained through the in-house development of online paperless logbooks allowed BAS to keep pace with the increased workload.

BAS staffing was unchanged for FY’06 with 12 employees, and continues to function 24 hours per day, 365 days per year. BAS is responsible for the monitoring, maintenance and development of the building automation computer systems throughout the general fund UM Ann Arbor campus buildings. To meet these obligations, BAS relies upon the extensive expertise of the Facilities Maintenance DDC & Energy Conservation Shop for field service and installation work and the newly formed Temperature Controls & Air Balancing Shop for chilled-water metering sensor calibrations, the Utilities & Plant Engineering mechanical engineers for HVAC-DDC system expansion designs, and Plant Operations’ Network Services group for Windows-based computer hardware and software maintenance.

BAS serves a diverse customer base, from Building Managers and Scheduling Coordinators to Central and Zone Shops to Engineers. Information is being distributed automatically by phone and email, by web pages and by remote terminals.

David Anderson
BAS Manager
Section II: BAS Organization Chart
Section III: FY 06 Financial Summary

BAS started FY’06 with a carry-over surplus of $24,420, and ended FY’06 with a carry-over surplus of $41,062, or 2.2% below budget. Improvements to financial tracking tools to allow more frequent updates than current monthly reports provide could improve BAS budget control, likely to within 1% or better without increasing the risk of ending the fiscal year over budget.

The most significant financial change in FY’06 was the receipt of new-space funding that has enabled BAS to improve preventative maintenance activities and provide computer panel and network infrastructure upgrades to continue at a responsible pace.

BAS successfully applied 97.8% of the allocated funds in FY’06 to the designated budget activities to further the mission of the University. In addition to operational efforts, BAS funded projects to upgrade a modest number of field panels.

General Fund

<table>
<thead>
<tr>
<th>Budget and Operating Results</th>
<th>General Fund FY2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditures</td>
<td>BAS</td>
</tr>
<tr>
<td></td>
<td>Budget</td>
</tr>
<tr>
<td></td>
<td>$1,843,048</td>
</tr>
</tbody>
</table>

Section IV: Year-End Operational Highlights

Building Automation Services

Building Automation Services (BAS) is part of the University of Michigan’s Facilities Maintenance department. BAS serves the University's General Fund Buildings, and a few non-general fund buildings (for a fee). BAS implements schedule and operational changes for various types of HVAC equipment and lighting systems, and monitors the general fund campus building automation systems for alarm conditions and energy efficient operation.

The system has been growing at a rate of over 15%/year, however in FY’06 the growth rate was over 20%, largely due to the addition of the Biomedical Sciences Research Building.

BAS growth in the prior year FY’05 included additional Utility Systems Technicians, which provided additional challenges in consolidating logbook entries in FY’06. Since more technicians were available, a new digital logbook was developed and brought on-line in FY’06.
allowing technicians to immediately see each others entries and quickly search for information regarding specific buildings, problems, etc.

Additional access to the BAS computer systems, added in FY’05 for the Utilities engineers was well received and in FY’06 an additional 15 engineers were utilizing the Building Automation System.

The “Continuous Commissioning” project was expanded in FY’06. Continuous Commissioning is a program where BAS system data is exported to a third-party database and analyzed for potential energy savings opportunities. Instead of a snapshot view, it sees an extended time period and catches flaws that may only show up occasionally. The savings opportunities identified, not including implementation costs (which vary based on whether or not equipment replacement is required to correct a given issue), were $482,260 for FY’06.

Tim Kennedy (BAS supervisor) has continued to provide updates directly to the U of M President, as a representative of the Voices of the Staff - Employee Recognition group. He began serving his 2nd year of his two-year appointment to the effort in FY’06.

Areas for Improvement
The BAS system is a conglomeration of networks and computer systems ranging from the latest state-of-the-art equipment and physical communications mediums to 20+ year old networks and equipment. The challenge for FY’07 and beyond is maintaining interoperability between the diverse systems and upgrading performance capabilities before operational problems arise. The additional ongoing challenge of providing the right level of communications to the right people at the right time will continue to receive priority attention in FY’07.
Portable power panel used around Campus to provide power to vendors.
Up to a half mile of cable can be used for this event
Section I: Introduction

The Plant Operations Central Electrical Shops are made up of four shops collectively, two administered under Utilities & Plant Engineering (UPE) and two under Facilities Maintenance (FM) with one foreman for each shop respectively. The administrative staff supporting these shops are comprised of one Electrical Utility and Maintenance Manager, one Work Control Coordinator, one Construction Project Coordinator, one Material Expeditor and one Office Services Assistant.

There are 31 Electrical Tradesmen combined between the two Electrical Construction and Electrical Technical Shops supported under Facilities Maintenance. There are times these shops are supported with up to eight electricians from our strategic vendor (Turner Electric) contract. These two Electrical Shops are responsible for electrical work done within all General Fund and Auxiliary buildings on the Ann Arbor campus. Electrical Construction work includes; customer pay, fixed price, AEC and Utilities & Plant Engineering designed projects. The Electrical Technical Shops responsibilities are; preventive maintenance and corrective repair or replacement of variable frequency drives, emergency and portable generators, uninterruptible power supplies, electrical support for operations and maintenance of boilers electrical controls in support of the UPE Outlying Boiler Shop.

In September 2005, a Material Expediter was hired to assist with delivering materials to job sites. This new position is funded by material overhead mark up and has allowed the Electric Shop as a whole to improve their customer service to the campus community by increasing the productivity of the Trades staff.

We continue to expand our FM Electrical Construction Shop High Voltage Construction work in support of the UPE department and their responsibilities for providing electrical services to newly constructed or remodeled buildings on the Ann Arbor Campus. In an effort to accommodate the increased workload, arrangements were made for additional labor through our existing Strategic Vendor (Turner Electric). Due to the large amount of HV construction and operational work, a decision was made to use Turner fifth year apprentices while the demand is present. This is viewed as an extension of training with Local 252 and was done in conjunction with Local 252 JATC program and their 5th year apprentice training. In return, the 252 JATC School offered to share training cost with the U of M for Electrical Safety classes held at their facility. They have also offered use of their facility for future shared cost training we deem necessary.

Shortly after the beginning of FY 06, a decision was made to transfer two Electricians working in the Mechanical Systems A/C Shop to the FM Electrical Technical Shops. These electricians are now job assigned to work with the A/C Shop to provide the technical services required. This re-assignment process has allowed for some O-J-T and internal cross training between all electricians within the Electrical Technical Shop and a larger resource pool for work load within the Mechanical A/C Shop. It also ensures the electricians receive proper safety training, PPE, or updates on new technology that can be utilized within this specialized area of the very broad electrical field.
We have funded and sent many staff within the central electrical shops to training in various areas of the broad electrical field this year some of which is previously mentioned in the Training Coordinators section of this report. Our shop staff has also actively participated in O&M training provided as part of new construction deliverables. Staff have also been sent to specific training like Chiller O&M training, Variable Frequency Drive training, Portable Generator Operator training, Uninterruptible Power Supply O&M to name a few. Keeping our recharge rate in mind we will continue to budget for this as a priority due to the rapid changing technology advances the electrical field.

Despite the financial and administrative challenges that occurred during FY 06, the FM Electrical Shop successfully navigated the organizational changes and expanded operations. While FY 06 was a successful year, more changes are still needed to improve our performance.

Joe Iott
Electrical Utilities and Maintenance Manager
Section II: Electrical Shops Organization Chart

- Facilities Maintenance
- Utilities & Plant Engineering
- Electrical Shops
  - Administrative Staff 50% FM/50% UPE
    - Electrical Construction
    - Electrical Technical
    - Primary Systems Distribution
      - Utilities Secondary Power & Lighting
Section III: FY 06 Financial Summary

Financially, the labor services provided by the Electric Shops presented in the following table indicate we only had a slight positive margin. Funding account information for one hospital capital improvement project was not applied in time for fiscal year-end rebilling to occur. This left a large portion of missing revenue which will be recovered during the beginning months of FY07. Had this rebilling occurred before FY 06 ended, the enterprise would have ended with nearly a 5% positive margin.

<table>
<thead>
<tr>
<th>FM Electrical Shops</th>
<th>YTD 2006 June</th>
<th>Monthly Budget 2006 June</th>
<th>Variance from Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment Transactions</td>
<td>1,557</td>
<td>0</td>
<td>1,557</td>
</tr>
<tr>
<td>Recovery from Rebill</td>
<td>4,667,113</td>
<td>4,225,217</td>
<td>441,896</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>4,668,201</td>
<td>4,225,217</td>
<td>442,984</td>
</tr>
<tr>
<td>Compensation &amp; Benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal Compensation &amp; Benefits</td>
<td>2,902,670</td>
<td>2,523,827</td>
<td>(378,843)</td>
</tr>
<tr>
<td>Other Expenses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment over 5,000</td>
<td>37,031</td>
<td>0</td>
<td>(37,031)</td>
</tr>
<tr>
<td>Consulting</td>
<td>3,623</td>
<td>0</td>
<td>(3,623)</td>
</tr>
<tr>
<td>Other Computing Services</td>
<td>9,128</td>
<td>1,100</td>
<td>(8,028)</td>
</tr>
<tr>
<td>Communications</td>
<td>10,406</td>
<td>10,400</td>
<td>(6)</td>
</tr>
<tr>
<td>Computers, Copiers, Fax</td>
<td>2,191</td>
<td>5,000</td>
<td>2,809</td>
</tr>
<tr>
<td>Overhead Recharge</td>
<td>341,616</td>
<td>341,610</td>
<td>(6)</td>
</tr>
<tr>
<td>Travel</td>
<td>4,290</td>
<td>8,200</td>
<td>3,910</td>
</tr>
<tr>
<td>UM Transportation</td>
<td>124,938</td>
<td>115,900</td>
<td>(9,038)</td>
</tr>
<tr>
<td>Conferences &amp; Training</td>
<td>12,802</td>
<td>25,000</td>
<td>12,198</td>
</tr>
<tr>
<td>Postage and Courier</td>
<td>169</td>
<td>48</td>
<td>(121)</td>
</tr>
<tr>
<td>Hosting Related Exp.</td>
<td>2,642</td>
<td>120</td>
<td>(2,522)</td>
</tr>
<tr>
<td>Rental and Storage</td>
<td>913</td>
<td>500</td>
<td>(413)</td>
</tr>
<tr>
<td>Memberships, Dues and Subs</td>
<td>161</td>
<td>3,525</td>
<td>3,364</td>
</tr>
<tr>
<td>Printing</td>
<td>710</td>
<td>950</td>
<td>240</td>
</tr>
<tr>
<td>Plant Rebilled Labor &amp; Material</td>
<td>92,304</td>
<td>28,000</td>
<td>(64,304)</td>
</tr>
<tr>
<td>Plant Operations Maint. Materials</td>
<td>549,594</td>
<td>825,000</td>
<td>275,406</td>
</tr>
<tr>
<td>Other Supplies and Materials</td>
<td>382,940</td>
<td>325,000</td>
<td>(57,940)</td>
</tr>
<tr>
<td>Other Expenses</td>
<td>31,223</td>
<td>13,800</td>
<td>(17,423)</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>4,509,353</td>
<td>4,227,980</td>
<td>(281,373)</td>
</tr>
<tr>
<td>Net Income before Transfers</td>
<td>158,848</td>
<td>(2,763)</td>
<td>161,611</td>
</tr>
<tr>
<td>Total Transfers</td>
<td>157,291</td>
<td>(5,642)</td>
<td>(162,933)</td>
</tr>
<tr>
<td>Net Change After Transfers</td>
<td>1,557</td>
<td>2,879</td>
<td>(1,322)</td>
</tr>
</tbody>
</table>
Even though one would say the results in the table below is about as close to even budget we can expect, our shops know very well there is a lack of funding for what it really takes for the O & M of all the equipment we are responsible for keeping in working order. Fiscal year 2006 was a difficult financial year for the Electrical Shops. Several years of budget reductions and increased workload made it difficult to stay within our general fund budget. The positive budget surplus shown in the table below is not a true accounting of how we finished overall with the two UPE and two FM electrical shops considered. At the end of the year we ended up with a $380 deficit.

<table>
<thead>
<tr>
<th>FM Electrical Shops</th>
<th>General Fund Shop Budget FY 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Budget</td>
<td>Ending Totals</td>
</tr>
<tr>
<td>Labor</td>
<td>919,145</td>
</tr>
<tr>
<td>Material</td>
<td>332,244</td>
</tr>
<tr>
<td>Total</td>
<td>1,251,389</td>
</tr>
</tbody>
</table>

We will continue to focus our attention to maintain a balanced general fund budget again in FY 07 as a top priority. If budget cuts continue into FY 07, our ability to respond in a timely manner to customer services requests or replacement of failed system components, will be limited. Over time the electrical systems we maintain will become less reliable. When failures occur, the down time will be longer. Our biggest concern is how these less reliable electrical systems will affect the University overall including its mission and service to the students, faculty and staff.

**Section IV: Year-End Operational Highlights**

**Electrical Construction & Maintenance / M6300 Paul Kroll, Foreman**

The Electrical Construction and Maintenance Shop consists of one foreman and sixteen electricians. It is responsible for electrical construction and repairs within all General Fund buildings and for a large percentage of auxiliary buildings on the University of Michigan’s Ann Arbor Campus. The work includes customer pay, fixed price, AEC and Utilities & Plant Engineering designed projects. All construction projects comply with the National Electric Code and the University of Michigan master specifications. The shop also supplies additional labor workforce for special events like the Annual Ann Arbor Art Fair or for supporting athletic events (football, basketball, baseball, softball, and hockey) with electricians working standby duties.

The Electrical Construction and Maintenance shop has been restructured and assigned all utility construction in addition to its facilities maintenance commitments. The shop has dedicated six staff to a separate crew of High Voltage Electricians in order to accommodate a long-term effort of constructing duct banks and installing high voltage cable. Outside lighting projects have been
merged into the shop in a joint effort with the Utilities Power and Lighting utility shop to continue these installations.

Project highlights and accomplishments during FY06 include:

• Utilities 2.4kv master planning (phasing out 2.4KV system services) generated projects funded from reserves for service upgrades to Elbel Field, Hill Street parking structure, and Coliseum were completed this year.

• A new 480 volt service upgrade to Fisher Stadium was done in conjunction for having enough power to supply permanent power for the new stadium lighting installed the previous year.

![Ray Fisher Stadium Service and Lighting Project](image)

Electrical Construction Shop in conjunction with Utilities Power and Lighting Shop installed a new upgraded main service which included permanent power for the new Ray Fisher Stadium Lights.

• Completed an emergency distribution expansion project as a result of our emergency preparedness plans within the Plant Operations buildings. This emergency distribution upgrade now supplies power for all shops and departmental critical systems load throughout the Plant buildings and gas pumps.

• Roof top de-icing systems were installed at Buhr, North Campus Transportation and Campus Safety buildings along with global temperature and light sensors. These systems improve the safety of students and staff, extend the life of these building roof systems and keep the energy costs to a minimum. All systems are connected and monitored by the Building Automation Systems group.
• Energy Conservation and Outreach projects related to building lighting and operation have been completed at Medical Science Research Building I, II and III; Campus Safety Services, Argus, Theater Arts, Chemistry, School of Music, and Power Center.
• Installed a new security camera system at Central Power Plant as part of UPE’s emergency preparedness plans for the facility. We also installed a new larger size 480 volt service to the Utilities and Plant Engineering building adjacent to the CPP to accommodate the increased load and improve its backup reliability.

Duct bank construction.

• A new duct bank was installed for Utilities department near the CVC construction site to replace an existing failing one. A portion of this work was related to the CGC to Central Power Plant interconnection project to improve backup capacity for the University of Michigan Hospital and their emergency preparedness planning. The underground duct work was a joint effort with the central electrical shops and demonstrates our shops’ capabilities.
• Extensive primary high voltage cable installations were completed throughout north and central campuses related to new building construction. This includes services to new substations in LS&A, West Quad., Academic Success Center, Hatcher South, Thayer Building, School of Public Health I, Weil Hall, Bursley Hall, and the new Ann Street Parking Structure. Our High Voltage Electricians also assisted the Utilities Primary Systems Shop in the major re-circuiting of all loads fed from the Southeast Switching Station so that the demolition of the Ross School of Business could proceed.

Areas of Improvement
Interviewed and hired four full time electricians to fill temporary positions which were previously held by our temporary workforce (Turner Electric). With the new shop structure on top of the existing workload, our ability to reach our goals (maintain work requests within budget, meet the goal of a 5% positive margin in our enterprises, improve customer communication and maintain or improve our response time) are compromised. The responsibilities and expectations established for the Electrical Construction Shop warrants funding for permanent support staff dedicated specifically to this shop.
Emergency Generator at the Undergraduate Science Building.  Caterpillar V-12 600 hp, turbo charged, natural gas unit capable of producing 450,000 watts of power

**Electrical/Technical Shop / M6250**  
Debra Ault, Foreman

Debra Ault was promoted as the new foreman for this shop in January 2006.

The Electrical/Technical Shop at the University of Michigan is comprised of 13 electricians and one apprentice electrician. Our primary duties consist of repair and replacement of variable frequency drives, emergency and portable generators, uninterruptible power supplies, electrical support for operations and maintenance of boilers for the Outlying Boiler Shop, electrical support for Direct Digital Control (DDC) system installations, electrical support of operations and maintenance for the Air Conditioning Shop, special power quality monitoring request by Engineering or Customers, and management and labor support for special event and emergency power needs.

**Highlights**
- This shop facilitated the redesign and retrofit of the Kraus Auditorium dimming system. The repair of the original light dimming system was determined not to be cost effective due to the age of the technology and the difficulty in obtaining replacement parts. After doing some research, our staff discovered and proposed a retrofit for the system to Plant Engineering. Funding was obtained, the unit was retrofitted, re-lamping was initiated and all completed within a small window of time between semesters.
A new managed contract was negotiated with G.W. Wacker to provide diesel fuel. This is vital for us to keep the portable and stationary generators filled and ready to go in the case of an emergency. We also rely on the portable fuel trailer purchased to keep the portable generators “topped off” when parked, during use for an event or while in use as standby unit.

Successfully provided power for the Ann Arbor Art Fair. Despite the extremely hot temperature during the two days of set-up, six electricians worked diligently to have the Art Fair powered up and running in a timely manner. One electrician was assigned on-call for any after hour emergencies during the event. The teardown after the event went flawlessly as well. This is a good demonstration of our staff’s willingness to work together to satisfy our customers.

Successfully initiated a request for a second room air filter system for the ATS unit at NCAC. Work is still in process as we await the installation of the larger fan unit. During FY 06, through joint funds made available from UPE and the University of Michigan Hospital, we also added an external bypass isolation system for the same unit. This addition allows for full electrical isolation of the unit for improved worker safety during routine PM or when corrective repairs required. Black & Veatch was hired to modify original O&M manual and provide a sequence of operation for our staff to follow in order to perform bypass operation while the system is in normal. We expect this work to be completed by mid FY 07.

Replaced the obsolete Uninterruptible Power Supply (UPS) unit in Randall Lab with a new MGE brand unit. We were presented with space issues since the new unit had a larger footprint. To meet the challenge, our staff solved the issue creatively by installing the unit in the middle of the room. This placement still allowed code-required access for service as well as the required clearance of other equipment in the same space. MGE showed their technical support by helping to troubleshoot a ground fault problem we were experiencing on the new UPS unit. We discovered that a power scrubber was being plugged into an outlet connected to the UPS causing the ground fault. Since the circuit feeds stairway plugs, it was deemed unnecessary and eliminated from the UPS unit.

Replaced 160 batteries on the UPS unit at the Duderstadt Center. Due to the large size of this project, the battery replacement was done by Interstate Powercare Company. Batteries were disposed of by OSEH and the system is running normally.
• Thirty-two batteries were purchased from Interstate Powercare to replace the old batteries for the Lurie Building UPS system. These were installed by our shop staff and the UPS has resumed normal operations.

• The Electrical/Technical Shop staff received praises from the UH Radiology department for replacing defective diodes in their Orthovoltage X-ray unit. Normally this type of work would have been sent to an outside contractor at greater expense and longer down time.

• As a result of substantial completion and opening of the new BSRB, we have added 57 new VFD’s, 2 – 2 megawatt diesel generators, diesel storage and fuel delivery system. These and the high-tech building emergency distribution equipment associated with the complex electrical systems will now be serviced by our shop.

• We completed a comprehensive report on our aging variable frequency drives to support a funding request for replacement. We’re seeking to replace these old units with newer technology that has greater energy saving capability.

Areas of Improvement

• Must facilitate approval and funding to increase manpower within the Electrical Technical shop. Several new buildings have come on line with new high-tech equipment to be serviced and maintained. We must increase manpower to better manage the increased work load. This is vital to the success of the shop and the campus-wide preventive maintenance program for variable frequency drives, emergency generators, automatic transfer switches, uninterruptible power supply units, and boilers.

• Improve communication between the Construction Management project coordinators and the Plant department. In order for my shop to maintain the equipment, we need to know; what is planned to be eliminated or saved, when the new equipment start-ups are done, modifications to the equipment that may have been done, and when training should be scheduled.

• Communication between Foreman and UPE Engineers must be improved to allow individual shops to operate more effectively and efficiently.
Plant Operations
Facilities Maintenance-Hospital Maintenance

FY 2006 Annual Report

Published: September 30, 2006

Matthew L. Hicks
Facility Operations Business Manager
Section I: Introduction

Healthcare facilities are expected to establish measurable standards of performance and ensure processes are designed to achieve desirable outcomes where undesired outcomes are avoided through application of technology for patients and the patient care environment. It is expected for Healthcare organizations to demonstrate the capacity to provide high-quality care and to continuously improve the performance of such care. The Plant-Hospital Maintenance Department supports these efforts through acting as a direct resource to the seven (7) management plans supporting the Environment of Care: Fire/Life Safety, Emergency Management, Security Management, Hazardous Materials Management, Equipment Management, Utilities Management, and Safety Management. The goal of the Environment of Care plans are to provide a safe, functional, supportive, and effective environment for patients, staff members, and other individuals who come to our facilities.

Plant-Hospital Maintenance is Plant’s largest Service Level Agreement (SLA) with over 100 employees, and receives collaborative support from several other Plant Departments, i.e., Engineering Services group, Construction Services group, and various Plant Shops. The Department’s primary charge is to maintain the physical environment and provide related services to support the Hospital in reaching its goal of excellence in healthcare and public service. The functional units within the Plant-Hospital Maintenance Department required to accomplish such tasks include:

**Electric Shop**
The Electrical Shop provide services related to electrical maintenance and repair of the Hospitals electrical systems that include high voltage distribution systems, building electrical distributed systems, fire alarm systems, security systems including card access, security cameras and other security systems, pneumatic tube systems, and various electrical equipment/components and power quality services.

**HVAC Shop**
The HVAC Shop provides heating, ventilation and air conditioning related services for all Hospital heating and cooling systems. This shop responds to all too hot/too cold calls throughout the facility.

**Plumbing Shop**
The Plumbing Shop provides services related to the maintenance and repair of plumbing systems, medical gas systems, and related piping within the hospital. This shop is responsible for waste water systems and domestic hot and cold water systems.

**Area I**
Area I is responsible for routine maintenance and specially requested maintenance jobs, projects, and painting services primarily for the University Hospital (UH), and Cancer Geriatrics Center (CGC).

**Area II**
Area II provides maintenance and repair services for Mott, MCHC, MPB, Women's, Med Inn, Holden, Taubman Center (TC) and Towsley.

**Area V**
Area V provides maintenance and repair services for NIB, Kellogg, Turner, East Ann Arbor Health Center, and all off-site clinic facilities covering an approx. 88 mile radius from UH Hospital.

**ENWAH**
ENWAH provides evening/after-hours, weekend, and holiday (Evening, Night, Weekends, and Holiday) maintenance coverage for all hospital and off-site clinic facilities.
Plant-Hospital Maintenance Mission Statement
The Hospital Maintenance Department, a member of the University Community, maintains the physical environment and provides related services to support the Hospital in reaching its goal of excellence in healthcare and public service.

Vision
- To be a department where continuous and measurable improvement in services is the standard.
- To be recognized by the Hospital and University community for excellence in service, as a partner in solving our customers' problems, and as the provider of choice.
- To be an innovative leader in facilities management. To be an organization where all employees are treated equitably and honestly.
- To be an effective, diverse work community.
- To be a learning organization, where all staff members are empowered and supported in reaching their full potential.
- To be a workplace where the atmosphere of trust encourages creativity and innovation.

Guiding Principles
Our vision can only become reality through the efforts of all members of the Plant Operations team. This requires that everyone identify processes that need to be improved and the milestones that must be achieved as we seek to be the provider of choice for those we serve. While keeping the vision before us, it will serve to remind us what we are to do. It is critical that we also give attention to how we do it. We will be guided by these principles:

Focus
We exist to serve the needs of the Hospital through partnerships and mutual understanding.

Integrity
How we do our work and how we relate to each other are of paramount importance. Our conduct must conform to the highest, uncompromising standards of trustworthiness and character. We will never knowingly make decisions that harm people or that is not in the best interest of the Hospital community.

Respect for People
Respect for people and their intrinsic worth is the cornerstone of our relationships with one another, our customers, and our suppliers. We appreciate the diversity of the human family and recognize our differences as sources of collective strength and wisdom.

Empowerment
We are a team. Team members are stakeholders in the success of the enterprise, and must be involved in the decisions that affect their work lives. "Empowerment", with its freedoms, responsibilities and boundaries, describes the intended work culture. Empowerment requires competence, sharing of information and ongoing learning. We are dedicated to becoming the best workforce in our industry. A person seeking to improve service to a customer will not be blamed for taking reasonable risks or for trying something new that does not quite work out.

Innovation
- We are a learning organization.
- We recognize that improvement of our work processes, our methods, and ourselves is essential to our success.
- We must be creative.
- We must challenge our own thinking. We must seek to learn from our mistakes.
Section II: Hospital Maintenance Organization Chart

Facilities Maintenance

Hospital Maintenance

- Electric Shop
- ENWAH
- HVAC Shop
- Plumbing Shop
- Area 1
- Area 2
- Area 5
Section III: FY 06 Financial Summary

Total revenue received under the Plant-Hospital Maintenance contract for FY06 was $11.78MM. This year’s financial performance supports a successful implementation of several internal business processes. The introduction of an encumbering process and the “fine tuning” of the various communication channels between Plant Operation’s internal business systems and the Hospital’s internal business systems has produced great successes.

The starting fund balance for FY06 was $583,418 and finished at is $298,579. This reflects approximately a 48% reduction during FY06. Period 1 for FY07 reflected a $3,425 positive fund balance after payroll accrual reversals!!

A very strong and well deserved praise to all who embraced the new processes and the successful delivery of communicating information supporting the new processes required to make it all happen: Admin Assistants, Melissa Berry and Carol Kirby, Plant Work Control Group, MStores Group, particularly John Bogi, Construction Services Group, Hospital Administration, and Hospital Maintenance Foreman. This year’s budget targets are identified by Program along with our “standing allocated” maintenance activity items. As the Department moves forward with its financial strategic initiatives, the ability to better define and manage operational costs is becoming more evident. We continue to meet or surpass our financial performance indicators and provide quality service to our customers while maintaining costs. It’s a privilege to communicate this level of success and “Kudos” to all involved.

<table>
<thead>
<tr>
<th>FY 06</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>($) VAR.</th>
<th>(%) VAR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Fund Balance</td>
<td>(583,418)</td>
<td>(583,418)</td>
<td></td>
<td></td>
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<tr>
<td>Total Revenue</td>
<td>11,779,693</td>
<td>10,861,841</td>
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<td>-7.8</td>
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<tr>
<td>Total Comp &amp; Benefits</td>
<td>7,650,698</td>
<td>7,500,034</td>
<td>(150,664)</td>
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<tr>
<td>Total Other Expenses</td>
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<td>3,070,485</td>
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<tr>
<td>Total Expenses</td>
<td>11,494,853</td>
<td>10,570,499</td>
<td>(924,354)</td>
<td>-0.8</td>
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<tr>
<td>Total Transfers</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Net Change After Transfers</td>
<td>284,839</td>
<td>291,343</td>
<td>(6,504)</td>
<td></td>
</tr>
<tr>
<td>Ending Fund Balance</td>
<td>(298,579)</td>
<td>(292,076)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section IV: Year-End Operational Highlights

Annual Fire Marshall Safety Inspection

The annual fire safety inspection was conducted during May 1 – 5, 2006. The Inspector General’s comment was: “Overall the facility is in excellent condition. The hospital has made significant progress in correcting and preventing further fire safety violations, including, fire wall penetrations”. Recommendations from the Inspector General included:
- All fire dampers are required to be labeled.
- The fire alarm coverage in the interstitial spaces is not adequate. After interviewing several contractors and employees, it appears that these spaces are frequently occupied.
Update on CMS 2005

The Centers for Medicare & Medicaid Services (CMS) is a Federal agency within the U.S. Department of Health and Human Services whose purpose is to assess the Hospital’s compliance with the CoP (Conditions of Participation) for all services and areas in which the provider receives reimbursement for patient care services. The goal of the inspection is to determine if the Hospital is in compliance set fourth within 42 CFR Part 482. Certification of Hospital compliance with the CoP is accomplished through observations, interviews, and document/record reviews and is used to assess compliance with Federal health, safety, and quality standards that will insure that the beneficiary receives safe, quality care and services. Hospitals who participate are required to be in compliance with the Federal requirements set fourth in order to receive Medicare/Medicaid payment/reimbursement. This is approximately $300 million for UMHHC. UMHHC received notification that CMS has granted “deemed” status with the Medicare Program and acknowledges that UMHHC is considered accredited under JCAHO. The letter received stated in part: "Michigan Department of Community Health (MDCH)........conducted a re-visit survey on May 5, 2006. The revisit survey revealed that your hospital is now in compliance with the Conditions of Participation." A well deserved “Thanks” was issued to the faculty and staff who worked so hard over the past 1½ years to meet the conditions of participation and bring UMHHC into compliance!

B & F Employee Satisfaction Survey of 2005

Results of the B&F Employee Satisfaction Survey were reflected in the matrix shown below. This matrix describes an accurate “picture” of the Department challenges and successes based on employee survey results. Strategic planning efforts have already begun to address Core Values (identified as a Priority item) and Workload, Training & Development (both identified as Areas of Concern) which was identified as a “Priority” item. Hospital Administration has approved proposed recommendation to remedy the workload concern by agreeing to fund a Scheduler/Planner position and the LearnerWeb Training Program is becoming “fine tuned” in developing and maintaining staff current skills levels.
Customer Survey
The Department has implemented a “web-based” survey process to solicit info and comments from our customers. The process has worked very well. The overall score received for Feb 2006 was 4.35. Highest ever within the last five (5) years!! Achieving satisfaction scores greater than the 4.2 target was achieved once again. The next Survey is scheduled during September 2006.

Utility Management
The Hospital’s on-going performance improvement activity for utilities is to maintain an average of one (1) utility incident/failure per month and achieve a monthly PM completion rating of 95% or above on Priority 4 rated equipment. This year’s average performance rating was 97.2%. Elevator entrapment performance targets were not met having 24 occurrences for the year, six (6) more than our targeted benchmark. During this period, there were 14 (fourteen) utility system related failures. Equally, there were 14 (fourteen) occurrences last year. The failures we have experienced continue to not indicate a suspicious or highly concerning trend in any one area. The yearly average of occurrences over the last six (6) years is 15.8; (2001-20 occurrences, 2002-17 occurrences, 2003-10 occurrences, 2004-20 occurrences, 2005-14, and 2006-14 occurrences). This year seventy-two percent (72%) of the total occurrences were Detroit Edison related. The primary causes of the DTE electrical outages this year were due to thunderstorm/severe weather activity. There were only two (2) Contractor related utility failures reported and both occurred within Area V. Component/system failures accounted for two (2) occurrences: Main gas line failure at Kellogg occurred and a blown fuse for MCHC medical air compressors. There were zero “in-house” related occurrences to report this year. This is the third consecutive year of such demonstrated success which is arguably a direct result of the Department’s high competency level and training.

Additional Highlights FY06
• Oxygen riser cleaning efforts were completed through collaborative efforts involving MGM, Respiratory Care, and the Plumbing Shop. Riser lines were cleaned and new valves were installed to support isolation strategies to allow future cleaning of individual zones. MGM will assist the Plumbing Shop in upgrading Medical Gas Prints, valve and line tagging and provide training on all parts of our system to the Medical Gas System Focused Service Group. We are scheduled to begin planning for zone shutdowns to rebuild O2 and air outlets in patient rooms and replace the alarm modules. Vacuum outlet rebuilds are also identified.
• Partnered with Horizon Engineering to complete Bar Coding of Priority 4 pieces of equipment for East Ann Arbor Surgery Center and develop Job Plans for these pieces of equipment to upload into MAXIMO. Similar activity to occur with CVC.
• O&M manual conversion to PDF: Began converting O&M manuals to PDF files for use in MAXIMO. This action allowed easy access for our Mechanics and Trades persons to reference maintenance related information on the equipment we service. We initiated our efforts with the newly opened Surgery Center in East Ann Arbor. We will continue these efforts with the Rachael Upjohn Building when it opens in Oct 2007. Similar activity to occur with CVC.
• Turned over Boiler Maintenance for Area 5 to Campus Outlying Boilers Services Group
• Nextel Phones and Safety: Existing as a de-centralized operation, Area 5 needed to explore additional safety alternatives. Staff is expected to work independently and often on roof tops and/or in isolated machine rooms thus supporting concern over the potential for staff to become injured on the job. We began looking into the feasibility of having a safety program involving Nextel phones. The plan entails using Nextel phones as a source of location identification with real time feedback to a local computer and/or an existing phone. As an example, an alert can be configured to ring the Foreman’s Nextel phone if a staff person in Area 5 phone has not moved for 15 minutes while on a particular job. This will enable the Foreman to simply call to ensure staff are safe, and if necessary, initiate actions to offer assistance. Area 5 staff has welcomed the added safety of this program.

• Expanded Sterilizer group with the addition of another Maintenance Mechanic III. The responsibility of this group is ever increasing and it will be important to lobby for more staffing in the near future as CVC and C&W open for business.

• Assigned a Maintenance Mechanic III with an extensive HVAC background to provide Preventative Maintenance activity on Area V emergency generators and HVAC support. Area 5 began this year with 4 Generators at Livonia Dialysis, Livonia Surgical, ECPW, and Kellogg eye center. Generator support now involves 6 additional units: Briarwood I, Burlington, Traverwood II, Arbor Lakes II, EAA Surgery Center, and the EAA Depression Center. Two additional units are on the way; one at our Survival Flight Hanger, and another is for EAA Health Center, having a combined total of 12 Generators.

• The addition of management staff: Administrative Assistant I, Melissa Berry, Steve Hnidy Afternoon ENWAH Foreman I allowing 24hr Mon-Fri management coverage, and a soon to hire Planner/Scheduler.

• New Industrial Electrician for midnight shift and new BMS Control/HVAC Mechanic.

• Overall improvements in MAXIMO data base (audit/update).

• The Department’s web page development is on-going. The goal is to allow the site to become more interactive and empower users to perform different tasks and inquiries related to maintenance department activities. The site continues to grow and become more functional for our customers. For latest developments visit: http://www.plantops.umich.edu/maintenance/hospital/

DEPARTMENT CHALLENGES

Commissioning

Commissioning is the process of advancing systems from a static physical completion to a state of full, demonstrated, and documented working order, according to design requirements. Costs saved to forgo commissioning and rely on the GC (general contractor) to deliver a complete product are not recommended. However, such practice is evident, as we are using internal and external resources to correct design flaws and/or issues on approved capital projects.

Commissioning efforts are to include equipment bar-coding/tagging and inventory before construction is complete for new facilities. As well, identify equipment/systems having a risk assessment APMI number of 12 or greater as outlined within the Utility Management Plan under the Environment of Care. Such equipment warrants a Priority-4 JCAHO PM schedule. The minimum suggested manufacturer’s PM actions of these identified pieces of
equipment/systems should match the labor resources required to properly maintain the
equipment/systems necessary to achieve the anticipated life expectancies and ensure the safe
delivery of the designed function. This action will help develop/implement a formal process
to receive FTE support for approved capital projects, newly purchased equipment, and/or
newly acquired facility space. Such process will help secure adequate maintenance support.

We are now consciously making decisions to incorporate commissioning efforts into our
capital projects and must establish similar practices for “below threshold” construction
projects.

Interoperability
It is prudent to develop protocol and identification of technology the Hospital intends to use
for equipment (HVAC), building (fire, security) controls, and systems monitoring.
Implementing and adopting a strategic planning process in this area will result in ownership
of a “seamless” controls operating environment. This is attainable with combining
synergetic efforts from Plant and Hospital resources. Must identify the “champion/s”
(Committee) to lead this effort. This action will promote “best practices” with regard to
building automated systems support structure and complement strategic initiatives related to
(HVAC), building (fire, security) controls.

Facility Design Process
This process illustrates a “best practice” for facility design initiatives supporting business
operations relying on various systems needed to sustain operations of any facility. Day-to-
day operations, maintenance procedures, repair processes, and capital renewal practices have
a large effect on long-term practices when proper facility planning prior to building
construction is performed. The Hospital has invested heavily in establishing personnel and
processes to support satisfactory results. Recognizing the benefits of “fine tuning” design
and programming processes before actual construction takes place is invaluable in
complementing healthcare practices within our environment. Such actions support the
overall mission and vision of the organization. The implementation of the Construction
Process Improvement Team (CPIT) will help to identify “best practice” initiatives supporting
this concept.

Hospital Administration has established such practice at its’ highest level through the vision
of Dr. Kelch, EVPMA and the implementation of the UMHS Strategic Plan 2010. Equally,
In order to remain aligned with Hospital goals and initiatives the Plant-Hospital Maintenance
Department Strategic Action Plan is now recognized as VISION 2012.
Plant Operations
Facilities Maintenance-Mechanical Systems

FY 2006 Annual Report

Palmer Commons Chiller Plant
Section I:  Introduction

Fiscal year 2006 was challenging as several years of general fund budget cuts took effect. Added to the challenge was our customers’ expectation for increased levels of service and the complexity and size of the mechanical systems in the new facilities that have come on line in the last Fiscal year.

The Mechanical Systems Department is responsible for the repair, maintenance and operation of the mechanical systems in general fund buildings and for a large percentage of the systems in auxiliary buildings on the University of Michigan’s Ann Arbor Campus. The department is comprised of seven Foremen, one General Foreman, one hundred and three Tradesmen, and two Work Control and Project Coordinators. The department’s FY ‘06 budget consisted of a combination of general fund and customer pay, labor and material revenue for a total of $15,553,050. The general fund portion of the total budget was $8,060,937 or 51.8% of the total budget.

The Mechanical Systems Department is divided into the following seven shops:

- Plumbing Systems
- Steamfitting and Pumps
- Insulation and Asbestos Abatement
- Chiller Systems
- Air Conditioning and Refrigeration
- HVAC Controls and Energy Conservation
- Temperature Control and Air Balance

During the past year, many vital programs central to energy conservation, system reliability and customer satisfaction were initiated or were continued from past years:

- Energy Conservation and Outreach (ECO) Program continued into its third year.
  - Steam trap replacement and maintenance program.
  - Building temperature control and mechanical systems tune up.
- Refrigerant Compliance Program.
- Best Practices Management program to clean the University storm water system on a semi-annual basis.
- Renewal of Service Level Agreement (SLA) with Dining Services for FY 07.
- The Air Conditioning Shop’s strategic reorganization initiative was completed in FY ‘06. The reorganization established shops dedicated to: HVA/C Controls and Energy Conservation, Refrigeration, Chiller Systems, and Temperature Control and Air Balance. The reorganization has allowed our staff to focus on responsibilities within their respective shops, rather than being pulled in many different directions throughout the day. Through this increased efficiency, we have been able to accomplish more work with less labor hours.

These and the other programs highlighted on the following pages led to a financially challenging yet successful year for the Mechanical Systems Shops.

Gary Ernst
General Foreman
Section II: Mechanical Systems Organization Chart

MECHANICAL SYSTEMS

- Chiller Systems
- A/C & Refrigeration
- HVA/C Controls & Energy Conservation
- Insulation & Asbestos Abatement
- Plumbing Systems
- Steamfitting & Pumps
- Temperature Control & Air Balance
Section III: FY ‘06 Financial Summary

Fiscal year 2006 was a difficult financial year for the Mechanical Systems Shops. Several years of budget reductions and increased workload took their toll on our general fund budget. At mid year we had a 4.3% budget surplus. However, by the end of the year our deficit had grown to (4.1%).

General Fund

<table>
<thead>
<tr>
<th>Mechanical Systems</th>
<th>General Fund Shop Budget Report FY 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning Budget</td>
</tr>
<tr>
<td>Labor</td>
<td>5,875,697</td>
</tr>
<tr>
<td>Material</td>
<td>2,185,240</td>
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<tr>
<td>Project Funding</td>
<td>229,043</td>
</tr>
<tr>
<td>Recovered from PPI</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8,060,937</td>
</tr>
</tbody>
</table>

The overdraft was largely due to:
- Many difficult chiller system start-ups in the spring of FY ‘06; which consumed more overtime than was budgeted.
- A series of unexpected equipment failures throughout the year. Each failure ranged in cost from $2,000 to $20,000. Equipment expenditures in this range are expected to be covered by departmental budgets.
- Urgent general fund work made it difficult to shift labor to customer pay work.
- Increased material costs.

For FY 2005 & 2006 many General Fund budget reductions were identified. The implementation status of the reductions is documented below:
- Eliminate Foreman overtime – Implemented.
- Reduce lead person pay – Implemented.
- Reduce overhead – Office supplies/lanyards – Implemented.
- Eliminate hosting – Implemented.
- Reduce fleet vehicle costs- Keep the old vehicles – Implemented.
- Reduce On-Call – Last two hours of coverage – Implemented.
- Reduce On-Call – During low use hours – Implemented.
- Reduce overhead – Minimize Union Contract release time – Implemented.
- Reduce overhead – Reduce Committee Activity – Implemented.
- Reduce summer picnic – Implemented.
- Reduce retirement parties – Implemented.
- Reduce overhead – Minimize Union participation in Employee Selections – Implemented.
• Eliminate MGF project work $30,000 to $39,999 – Implemented.
• Eliminate MGT project work $20,000 to 29,999 – Implemented, except for three projects in this range.
• Replace Trades retirement with Apprentices – Partially Implemented.
• Reduce overtime to only essential high priority work – Implemented, but not successful in reducing overtime.
• Reduce overhead – Travel and Training costs – Travel eliminated, yet essential training was completed.
• Reduce material purchases – Attempted to implement, but purchases increased due to systems needs.

Increased focus and attention to maintaining a balanced general fund budget for FY 07 will be a top priority. FY ‘06 budget cuts continuing into FY 07 will limit our ability to respond in as timely of a manner to customer complaints and to purchase and replace failed or nearly failing system components. As the University’s mechanical systems become less reliable and as failures do occur, down time will be extended. The concern, of course, is the impact of less reliable mechanical systems toward the University’s mission.

**Enterprise Report**

<table>
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<tr>
<th>Mechanical Systems Enterprise Report FY 2006</th>
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</thead>
<tbody>
<tr>
<td>FY 2005</td>
</tr>
<tr>
<td>Total Revenue</td>
</tr>
<tr>
<td>Total Expense</td>
</tr>
<tr>
<td>Total Revenue/Expense Variance</td>
</tr>
</tbody>
</table>

The Mechanical Systems Enterprise Report shows that both total revenue and expenses grew from FY 2005 to FY 2006, with revenue growing 2.8% faster than expenses. The variance between FY 2005 total revenue and expenses was $100,659 or .65%. Considering all factors that make up overhead expense estimates at the beginning of the year and the potential variances from these estimates, .65% is a reasonable variance. Going forward we will continue to pay attention to overhead expenses and adjust as needed to improve our initial estimates, which will help to balance the FY 07 enterprise revenue and expense report.
Section IV: Year End Operational Highlights

Air Conditioning and Refrigeration

Frank Hilberer, Foreman

The Mechanical Air Conditioning and Refrigeration Shop (MACRS) is comprised of one Foreman and sixteen Air Conditioning and Refrigeration mechanics. All of the staff is EPA certified to install, remove and handle all refrigerants.

The MACRS is responsible for all refrigeration equipment in GF buildings on U of M’s Ann Arbor campus and for a great deal of the equipment in non general fund buildings. Examples of refrigeration equipment serviced:

- Cold rooms, ultra-low temperature freezers
- Compressed air dryers
- Ice machines, salad bars, pop machines, etc.
- Controlled environment chambers
- Walk-in and reach-in coolers & freezers
- Self contained A/C units
- Small package chillers

The MACRS is also responsible for:

- Maintenance and operation of the reciprocating and screw chillers on campus.
- Management of the U of M’s Refrigerant Compliance data base.
- Computer server rooms.
- Direct expansion air conditioning systems through out Campus.

The MACRS has service level agreements with Dining Services, Yost Ice Arena, Ford Library, and Property Disposition to repair, maintain and dispose of their refrigeration and air conditioning equipment.

WHAT’S NEW IN FY ‘06:

- Dining Services renewed their SLA to repair and maintain refrigeration and air conditioning equipment. The number of corrective work requests we receive from Dining Services is declining, primarily due to the properly funded preventive maintenance program we implemented for them.
- Dining Service continues to contract with us to install new refrigeration equipment.
- OSEH has made a commitment to fund refrigerant and oil removal from appliances in general fund buildings. The intent is to encourage recycling of older equipment.
- ITCOM has initiated several projects to replace their older server room A/c units.
- Employees Working Out of Classification (EWOCs) were used to clean condenser coils on A/C units and to assist wherever necessary. This has proven to be an effective and cost saving use of manpower.
- Two Apprentice positions were filled for the A/C Shops.
HIGHLIGHTS:

- The continuation of the Refrigerant Recovery Center (RCC). Obsolete and defective refrigerant containing equipment declared scrap by Property Disposition is transferred to the RCC. Declared scrap cannot leave campus if it contains refrigerant. The refrigerant and refrigerant oil are recovered and sent to a recycling center. This program is necessary due to provisions within the Federal Clean Air Act dated July 1, 1992.

- The Air Conditioning Shop reorganization and formation of a new Temperature Control and Air Balance Shop has put a new focus on the way HVA/C work is done now. The new shop organization is allowing our mechanics to focus closer on specific tasks rather than being pulled in all directions.

- BSRB has been bought on line. This building contains over 30 environmental rooms, 16 ice machines, and numerous refrigerators, freezers and refrigerated lab equipment that will need to be maintained.

- Arbor Lakes building #2 underwent a renovation, which in essence will bring all of the Hospitals electronic storage operation to that building. That requires 200 tons of cooling equipment, which this shop will be maintaining.

- Yost ice making equipment overhaul was completed without any problems. Ice was made and Yost was up and running by July 4, 2006, despite the unseasonable hot weather this summer.

Yost Ice Arena

- The continuing successful Window Air Conditioning cleaning program is a joint effort between the Machine Repair Shop and the Air Conditioning Shop. The Machine Repair Shop manages the EWOCs that do the actual cleaning. The MACRS assists with coordination and technical support when needed. Benefits of the program include:
  - Improved equipment operation and fewer failures resulted in improved customer satisfaction.
  - Reduced workload for the MACRS during the busiest times of the cooling season.
  - Extended equipment life.
AREAS OF IMPROVEMENT:

- To provide improved customer service, shift changes were implemented to provide longer hours of coverage. Staff is now available Monday through Friday from 6:00 AM to 4:30 PM. For the most part this has been beneficial for most of the year; we are looking for ways to improve coverage during the height of the cooling season even more.
- A temporary data entry person from Work Control helped with the data entry for the refrigerant recovery compliance program. This greatly improved our timeliness from the completion of the field work to the entry of the data in the compliance system.

**Chiller Systems  
Craig Butcher, Foreman**

The HVAC Chiller Systems unit is comprised of one Foreman, 12 Air Conditioning and Refrigeration Mechanics, and two Mechanical Systems Field Service Specialists. In addition, HVAC apprentices are assigned to Chiller Systems during parts of their 5 year apprenticeship training.

Chiller Systems operates, services, and maintains large scale chiller systems that provide cooling to general funded buildings throughout the University of Michigan’s Ann Arbor campuses. Chilled water systems differ from other systems, such as direct expansion systems, in that they cool using a circulating heat transfer fluid, serve larger building or complexes of buildings, and require management and operation of relatively complex interactions between multiple subsystems of controls and equipment, including chillers, heat exchangers, cooling towers, coils, strainers, pumps, valves, sensors, meters, and other system components. A chilled water system can consist of one chiller and one building, but increasingly our systems are chilled water plants, in which multiple chillers are tied together to serve at least one but usually two or more buildings.

For our purposes, a “large scale” system is capable of transferring 1.2 million Btu or more of heat energy per hour. Incessant construction and renovation at the UM makes determination of exact numbers more a matter of definition than of arithmetic, but at last count, Chiller Systems is responsible for 48 absorption chillers and 36 centrifugal chillers. The average cooling capacity of our absorption chillers is 625 tons, and that of our centrifugal chillers is 545 tons. Our largest system can remove over 48 million Btu per hour from the buildings it serves, in the process pumping enough chilled water to fill a large public swimming pool in 15 minutes, and evaporating more than 5000 gallons of cooling tower water each hour.

To operate and service these plants, HVAC personnel must work closely on a day-to-day basis with the Plant Steamfitter shop, Plant Plumbing shop, the Electric Shop, Machine Repair, the Sheet Metal shop, Plant Engineering, Plant Utilities, Zone Maintenance, and Work Control.

An important part of the Chiller Systems group is the Water Treatment team. This team currently consists of two full-time skilled trades water treatment technicians, who work closely with other staff and with our water treatment consultants to monitor and maintain the water condition of open and closed loop systems.
HIGHLIGHTS

Reorganization. In FY ‘06, the department saw completion of a long planned reorganization of the HVAC shops from the “old model” of “one staff, one building” to a new division of staff duties according to system function. In the good old days, each building was pretty much a self-contained entity. Equipment and systems were simpler, and it was feasible to expect one HVAC service person to handle nearly every AC responsibility. The past decade and a half, however, have seen the University not merely enlarged but also transformed. Buildings have been connected together. Modern digital controls operate HVAC systems of vastly greater capability and complexity than anything that had existed before. The ratio of available HVAC staff hours to air conditioned square footage was falling precipitously at the same time that costly, cutting edge chiller technologies were proliferating across campus. To help meet the new needs of the new University, the Chiller Systems unit was created. Its mission:

- focus on the new large scale chilled water systems which provide critical HVAC services
- improve service skills and expertise that these systems require in order to operate
- increase effective co-operation with PME and with other trades to improve CHW system performance
- devote more service time to upgrading pre-existing infrastructure

This process got underway during FY 2005 by functional reassignments within existing shops. Full HVAC reorganization was completed in January 2006, with creation of a separate AC shop to handle comfort calls and dedication by shop to the new functional responsibility areas.

Startups of New Plants and Systems. The UM HVAC infrastructure continues to evolve and grow at a breakneck pace. Among the additions and changes this year in which Chiller Systems has been involved:

- Creation of the new Hatcher chiller plant that ties together Hatcher, Hatcher North, the President’s Residence, Clements Library, Tappan Hall, the Art Museum, and the Art Museum addition. This plant will ultimately also be connected to the Central Chiller Plant via a tie to Shapiro Library.
- Weill Hall
- Thayer Building being added to the MLB chiller plant
- BSRB chiller plant
- School of Public Health chiller plant
- First full year of operation for North Campus Chiller Plant
- Cancer-Geriatrics Center/Med Sci I Chiller Plant
- LSA Plant
- MSRB2 Chiller Plant conversion to year round operation

It would be difficult to overstate the magnitude of these transformations, or the amount of service time and expertise, both in and out of the AC shop, which their construction and implementation have required.

Chiller Plant Model Continues to Unfold. Of the new systems added and changes made above, only one building (the new School of Public Policy) was a one-chiller/one-building pair. All the other changes involved either creation of new chiller plants, tying new or upgraded buildings to existing plants, or additions and renovations to chiller plants. Fifteen years ago, we were just
putting together the East University (a.k.a. Dennison or Central) chiller plant, and breaking new ground thereby. Ten years ago, more than half our capacity was still building-by-building.

**New Cutting Edge Chiller Technologies.** In all our new plants we are installing the latest chillers from the two top chiller manufacturers in the world. The chiller plants listed above contain no fewer than 16 chillers 3 years old or less, many with variable speed compressors, all featuring modern microprocessor control, all capable of efficiencies unattainable less than a decade ago—less than 0.6 kW/ton under some conditions. Today’s new equipment requires a more extensive skill set to operate and maintain, and the control components in particular have much shorter life cycles than the controls of earlier equipment did. Operating software changes constantly, and our service staff needs to keep abreast of it.

At the LSA chiller plant, we have installed our first variable flow primary chilled water system. This is a radical departure from traditional chiller system designs and requires careful control, mostly to prevent the chiller evaporator from freezing. However, it also significantly reduces pump and chiller energy consumption. Fully implemented on a large scale in major chiller plants such as we have here at the University of Michigan, variable primary flow offers potential energy savings of millions of dollars, especially as energy prices continue to increase over the coming decades.

At Lorch Hall, Plant is conducting an interesting experiment with a condenser water treatment technology which, if it proves successful, offers the possibility of near-zero blowdown cooling tower systems in some locations. Cooling towers work by evaporating about one pound of water for every 1000 Btu of heat rejected. The evaporating water leaves behind everything that was dissolved in it, basically making the remaining tower water harder. If the hardness gets too concentrated, it solidifies on chiller heat exchange surfaces, and this dramatically reduces chiller efficiency. We keep our tower water from getting too concentrated by blowing some water down the drain from time to time and refilling the sump with fresh water. This also costs money. At Lorch Hall, the University is trying out a system which changes the way some of the ions in water tend to precipitate out of solution, making the blowdown much more effective. It’s a very neat idea in theory. In practice, it is fairly complicated. The picture above shows some of the apparatus used to treat the Lorch cooling tower. Most of the equipment shown in the picture (blue and white tanks, grey piping, black tubing, and 6 square control boxes on the left) replaces a single control box and blowdown valve in a traditional system. The Lorch test should tell us whether and how effectively this approach could be scaled up for bigger system such as that in the Chemistry building, which is 13 times larger.
At BSRB, we are operating a new, dual-mode system, in which two pairs of chillers work in series. Chilled water passes through the absorption chiller first and then through the centrifugal. This takes advantage of the relatively greater efficiency of the absorption chiller at higher input temperatures, and the ability of the centrifugal to deliver chilled water colder than an absorber can. It also results in a greater attainable temperature difference in the delivered chilled water.

At Hatcher chiller plant, a new variable speed drive centrifugal is paired with a Horizon steam absorption chiller. These machines are not piped in series, but the combination gives us more flexibility than a non-hybrid plant offers.

AREAS OF IMPROVEMENT
Water Treatment. Our water treatment staff was upgraded to skilled trades status, better reflecting the capabilities and importance of their skills and contribution in this critical area. Monitoring and reporting tools for condenser water biological safety and for minimizing unnecessary tower water consumption continue to be improved.

Staff. Retirements in the past two years has allowed us to bring into our shop some particularly capable new staff with comprehensive experience in major chiller service operations. These extraordinarily skilled individuals chose to leave major chiller manufacturer service organizations in order to become members of our UM HVAC team. For us, their move came at the best possible moment, because they were in place to provide critically needed expertise when most needed. Our existing staff has leaped at the opportunity to work with and learn from these new team members.

Team Skill Improvement. We believe our reorganization has already paid off in improved staff skills and ability to respond to critical situations. We have seen a number of premature bearing failures in new Trane centrifugals, as well as oil regulator problems, leaking flat gaskets, and variable frequency drive breakdowns. Working together, our entire team has been able to respond much more effectively to these challenges than we could have done even three years ago. For instance, we have implemented changes in the CH530 operating software to protect our CVHF chillers from lubrication issues attendant upon exposure to excessively cold condenser water. When Chiller #2 at Palmer Commons lost a bearing, we were able to perform the entire teardown and rebuild ourselves instead of contracting it out, by no means a trivial undertaking, given that the motor assembly alone weighed more than the rated lifting capacity of the service elevator. We retrofitted the VFD on Chiller #2 at MLB with a wye-delta starter, and modified chiller #1 to correct problems with the free cooling option.

Co-ordination with Engineering. We are working to partner more effectively than ever before with Plant Engineering in wringing the maximum performance from our infrastructure. Our chiller plants are not simply plug-together assemblages of pipes and machinery; each is rather a unique, integrated system of interrelated elements that interact in complex ways. Our crew members are tasked to become experts, not only in servicing individual pieces of equipment, but on the chiller systems themselves. To this end we are working with Plant Engineering on a continuous improvement process for exchanging information and expertise. Plant Engineering has tasked staff to focus on chilled water plants. Our staff have begun meeting regularly with
Plant Engineering staff who share responsibility for the same systems. We are now receiving improved reports of chiller systems performance.

**CHALLENGES**

**Attacking Infrastructure.** This image shows one of the challenges that can arise when tying old and new systems together. The new upgraded CGC chiller plant connection with Med Sci I entailed conversion of old condenser water piping to chilled water piping. This increased the cooling available to Med Sci I by increasing the amount of water which could be supplied, and did so without having to lay new piping, thereby saving a considerable amount of money. However, old pipe, and especially old condenser water pipe, has drawbacks. Hospital and Plant HVAC staff continue to work to clean up the chilled water systems, as well as maintain them against the inevitable degradation which the ravages of time inflict.

Modern chiller systems, for all their high-tech features, still depend upon old fashioned things like valves, pumps, strainers, and cooling towers. The service lifetime of a chiller is around 25 to 30 years, but the useful service life of many of these other essential components can be a decade or less. Also, the more critical the cooling need, the more critical it is that such items be in place and functional. Unfortunately, when buildings are being designed, the financial pressures to leave these things out are intense; and, in normal operation, there never seems to be enough time or money to add them in, or to replace all of them when they fail. A major rationale behind our reorganization has been to improve our ability to focus on these needs.

One good example: identification and replacement, and sometimes first installation, of needed isolation valves to serve pumps and strainers. Just as one does not absolutely need to fix a roof leak until it rains, in the storm and turmoil of day-to-day operations, one often finds one’s self obliged to “get by” with a leaking (or missing) valve until an emergency gives one the opportunity and justification to deal with it definitively at last. Waiting for emergencies, however, is not be best way to plan. In this past year, Chiller Systems, working with the plumbing shop, has expended considerable time and money seeking out and attempting to correct mundane deficiencies. We have made great progress, particularly in the MSRB2 chiller plant, where we replaced more than twenty large isolation valves—work that paid off by preventing at least two extended interruptions of cooling due to electrical failures in equipment that fed critical pumps. Nevertheless, we still have a considerable way to go, even in this one plant.

**Future Energy Costs: No End in Sight.** Chillers at the UM fall into three categories: steam absorption chillers, electrically driven centrifugal chillers, and other types of electrically driven chillers such as screw machines. Even though the BLS fuel and energy PPI has changed 230% since 1998, and the all-commodity PPI has increased 126% in the same period, the cost of delivered electrical energy per kilowatt hour within the University has remained virtually steady.
However, our UM internal delivered steam cost is an entirely different story. It stands today at 2.35 times the 1998 rate. This has had a dramatic impact upon the cost to the University community of chiller system operation, since installed nominal chiller capacity at the UM is approximately 1.4 steam absorption tons for every ton of electrically driven cooling, and the energy input cost per ton of absorption cooling is now approximately 6.6 times that for electrically driven chillers. In point of fact, the actual integrated applied load fraction of absorption to electrical capacity is greater than 1.4. This is because older plants tend to be more overloaded than the newer plants are, and the older plants have more absorption chillers, so the typical absorber will operate more hours and do more cooling compared to its capacity than the typical centrifugal would.

Minimizing Energy Costs, Maximizing Efficiency. Building, operating, and maintaining chiller systems of the size and complexity we have at the UM is horrifically expensive. Energy costs make up by far the bulk of these expenditures, amounting to several hundreds of dollars an hour apiece for larger chillers, and they continue to rise: in the past five or six years, steam costs have risen nearly fourfold. Available resources to pay for these services continue to be severely constrained. There are a thousand ways to make a chiller less efficient, and keeping a system performing as well as it possibly can requires unremitting application of service time and constant attention to countless details.

According to manufacturer’s sales literature, a pneumatically controlled single effect absorption chiller could theoretically use as little as 18.7 pounds of steam per ton of cooling (18.25 \(10^3\) Btu, based on an input of 5 psig steam at the steam chest inlet). In reality, this is an unrealistic figure which can be achieved only by maintaining unvaryingly optimal operating conditions of cooling load, cooling water temperatures, chiller trim, water flows, condensate handling, and other factors. A more realistic figure would be 20 pounds of steam per ton for an actually installed, well operated and maintained chiller running at full load. Even this can be a considerable challenge with the staff hours available, and is often simply unattainable if other things go wrong, such as when a cooling tower fan failure raises the condenser water temperature a few
degrees. At 20 pounds of steam per ton of cooling, the mean size absorption chiller, operating at 60% average full-season load for a 2400 hour cooling season, will at today’s rates run up $615K per year in steam charges alone. The same chiller in 1998 would have used “only” $262K worth of steam. This is a dramatic transformation of our customers’ operating cost environment. Today, cooling is a basic service without which most research and other activity is not possible, and indeed without which our more modern buildings are virtually unusable for any purpose. Since we generate steam with natural gas, a huge part of our customers’ costs is simply what the market rate of this one type of energy decrees it shall be.

![Change in Steam & Gas Costs 1998 to Present](chart.png)

### HVAC Controls and Energy Conservation

John Gruden, Foreman

The HVAC Controls and Energy Conservation Shop is comprised of one Foreman, four Steamfitters, and fifteen HVAC Control Specialists.

The Controls Shop installs and maintains the Direct Digital Control (DDC) systems in all of the general fund buildings on the Ann Arbor Campus and in most of the non general fund buildings that have DDC systems. The Shop is responsible for the wiring connections, Programming, and start up of all the DDC cabinets for all new construction projects on Campus.

The Energy Conservation Outreach (ECO) program is a large part of the Control Shop’s responsibilities. The Control Shop is responsible for the building tune-up portion of the program:

- Complete tune-up of building HVAC systems which includes operational testing of:
  - Pneumatic, DDC, electric, and electronic controls.
  - Dampers, humidifiers, heating and cooling valves, heating and cooling coils, heat exchangers, supply fans, return fans, exhaust fans.
  - Room controls.
- Testing and maintenance of the steam, hot water and chilled water distribution systems which includes the following:
  - Testing of valves and steam traps.
- Repair or replacement of the valves and traps depending on the results of the testing.

The shop is responsible for the maintenance and reading of the condensate and water meters, which is vital for proper billing of utility charges to University Buildings:

- Accurate reading of 200 steam condensate meters throughout the central, athletic and medical campuses.
- Accurate reading of water meters.
- Analysis of monthly readouts to determine proper functioning of metering systems.
- Preventive maintenance and repair of metering systems.
- Testing and research into new technologies of steam metering devices.
- Preparation of monthly reports for the Utilities Department as an aid in the billing process.

WHAT’S NEW FOR FY ‘06

- A new energy conservation program to add override controls to customer operated room sensors has been initiated by the Energy Conservation Outreach committee and is being implemented by the DDC Control Shop. The benefit of the initiative is more flexible after hours operation of HVA/C equipment. The new override timer allows building occupants the ability to start HVA/C equipment after normal working hours. With this ability we are able to schedule energy consuming equipment off for longer hours, which conserves energy and saves money for the departments.
- Due to increasing energy costs the proper installation and operation of flow and BTU meters is very important. The DDC Control Shop is responsible for the proper interpretation of the raw meter data. The raw data is translated through programming code into the DDC system. Once it is in the system the Building Automation Services (BAS) Staff and the Utilities Staff, can use the data for billing and operational purposes.

HIGHLIGHTS:

- The old work horse technology for our DDC system for many years has been the Stand Alone Control Units (SCU). Unfortunately this technology is now obsolete and repair parts are no longer available. The DDC Shop is in the process of replacing all of this old technology with the updated Modular Building Controllers (MBC). In FY ‘06, fifteen of the old systems were replaced with MBCs.
• In FY ‘06 eleven new construction projects with a DDC budget of $2,193,599 were the responsibility of the DDC Shop. Six of the projects are complete, including commissioning; the remaining five are complete with the exception of some commissioning tasks. After expenses the remaining balance of the budgeted amount is $260,228 or 11.8%. We estimate after the completion of the remaining commissioning tasks, we will have a positive balance in the 4% to 5% range.

• The eleven projects discussed in the above bullet are: BSRB, Perry Addition, LS&A renovation, Hatcher Chiller Plant, Thayer Building, Buhr TEC project, Undergraduate Science Building, Computer Science Building, Biomedical Medical Engineering Building, Pharmacy 2nd and 3rd floor renovation, and the ISR Chiller replacement.

AREAS OF IMPROVEMENT:

• Two open positions were filled with former Siemens employees. The addition of these experienced tradesmen has improved the shop’s ability to complete construction projects and maintain the Campus Siemens DDC system.

• An arrangement between the Electrical Technical Shop and the DDC Shop is providing two full-time Electricians to the DDC Shop. This arrangement has improved our ability to complete energy management projects funded by the ECO program.

**Temperature Control and Air Balance**

Randy Fox, Foreman

The Temperature Control and Air Balance Shop (M3700) is comprised of one Foreman, one HVAC Controls Specialist and eleven Air Conditioning and Refrigeration Mechanics.

The M3700 mechanics primarily respond to work requests for comfort complaints. We service pneumatically and digitally controlled variable air volume box controls, fan coil unit controls and pneumatic air handling unit controls. We make controls adjustments for animal rooms, lab pressurization and ventilation noise complaints. We provide water and air balance services, service and maintain building exhaust systems and their associated fume hoods and also service humidifiers

WHAT’S NEW FOR FY ‘06:

• The new air conditioning shop, M3700, was created to respond to the above mentioned issues. M3700 began operating in mid-December 2005.

• Part of the room comfort responsibility has required M3700 workers to learn the operation of electronic variable air volume boxes with electronic thermostats and electric valve and damper motors. M3700 personnel have worked with the digital controls shop, M3600, in new construction setup of these box controllers.

• As part of their duties, M3700 personnel took responsibility for maintenance and repair of electronic humidifiers which were not maintained by the plumbing shop.

• Also, the air and water balancers have been requested by the Plant Utility Department to verify the accuracy of chilled water meters in campus buildings and their respective chiller plants.
• M3700 begins assisting M3400 with filling chilled water systems in the spring and draining them in the fall.

HIGHLIGHTS:
• All personnel have been trained in troubleshooting Siemens Electronic Terminal Equipment controllers.
• The North Campus service team has been trained in troubleshooting Advanced Controls electronic VAV box controllers.
• Air/water balance personnel learned setup and calibration of Toshiba and ABB flow meters, and gaining familiarity with maintenance and repair of DriSteem humidifiers.

AREAS OF IMPROVEMENT:
At the time of the creation of shop M3700, the backlog of “too hot”/”too cold” complaints numbered about three hundred. In the first few weeks the number of outstanding work request was reduced to an average of about 40 for many weeks.

In past years, A/C mechanics were required to respond to various customer complaints in their work zones. Among these were air handler trips, hot complaints, cold complaints, and room pressurization complaints. Often these complaints would draw the mechanic away from his off season job of overhauling chillers, draining air handler chilled water systems for the winter, and refilling systems in the spring.
As anticipated, the change of season (winter to spring) has increased the number of heating to cooling work requests for room discomfort complaints. It will likely occur again in the fall.

**Insulation and Asbestos Abatement**  
**Fred Riecks, Foreman**

The Insulation and Asbestos Abatement Shop is comprised of one Foreman and ten Pipecovers.

The Foreman has professional certifications and accreditations related to the management of Asbestos in the following areas:

- Building Inspector
- Management Planner
- Project Designer
- Contractor Supervisor

All of the Journeymen Pipecoverers have extensive training and certification in proper work methods of asbestos abatement. They are Contractor/Supervisor certified, which qualifies them to do all aspects of asbestos abatement. The certification requires yearly training by a recognized State Certified Trainer.

The Insulation and Asbestos Abatement Shop provides the following services:

**Insulation:**
- Ensures constant chilled water, hot and cold water, and steam piping temperatures.
- Ensures constant air temperatures in heating, ventilating, and air conditioning ductwork.
- Provides burn protection from hot pipes, ducts, and boilers.
- Eliminates condensation from chilled water and cold water piping and from air conditioning units and their ductwork.
- Provides high temperature insulation blankets for the University’s powerhouse turbines generators.

**Asbestos Containment and Control:**
- Removal and disposal of asbestos containing materials i.e.: Floor tile, pipe insulation, ductwork, boilers, plaster, etc.
- Clean up of debris and encapsulation of damaged asbestos.
- Drilling of holes in transite fume hoods, asbestos containing laboratory tabletops, floor tile, etc.
- Test samples of suspect materials for asbestos content.

**WHAT’S NEW FOR FY ‘06:**
- To improve the insulation and asbestos service needs of the University of Michigan Hospital System during FY 2006, two Pipe Coverers from the Mechanical Systems Insulation and Asbestos Abatement Shop were assigned to the Hospital Construction Services Group. This assignment provides full-time insulation and asbestos abatement
coverage for both the Hospital Maintenance Department and the Construction Services Group.

• In addition to benefiting the Hospital’s maintenance and construction activities, this customer-pay activity reduced pressure on the Insulation Shop’s general fund budget.
• Customer safety concerns and federal regulations require constant monitoring of equipment for asbestos abatement activities. To meet these needs, the Insulation Shop continually assesses the performance of new equipment as it becomes available. New more efficient carpet and tile removal equipment was purchased in FY 2006.

HIGHLIGHTS:

• The shop has entered into a Service Level Agreement with the Central Power Plant. With this agreement, a full-time Plant Operations Insulator has been hired and assigned to the Central Power Plant to complete the insulation work there. In the past, insulation work at the Powerhouse has been contracted to outside vendors.

![The Powerhouse Insulator stands next to a turbine currently under renovation.](image)

• FY 2006 saw a substantial increase in customer pay work requests. The increased workload required the addition of two temporary journeymen pipecovers to the shop’s staff. While two temporary employees helped to meet the added customer demand, the customer pay backlog continues to grow.

AREAS OF IMPROVEMENT:

• A top priority in FY 2006 was to increase the amount of time the Foreman spent with the primary customers who use the services of the Insulation and Asbestos Abatement Shop. Despite the increasing administrative tasks required of the Foreman, the shop met this priority.
• Better communication between shops, primarily due to shop Work Control Coordinators, has improved worker morale and increased work request completions.
• Improved vendor contracts through Purchasing have simplified hiring additional temporary manpower during peak workload periods.
Plumbing Systems

Ivory Sims, Foreman

The Plumbing Shop is comprised of one Foreman, one Steamfitter, one Apprentice Plumber, three Sanitary & Storm Water Systems Specialists and seven Plumbers.

The Plumbing Systems shop is responsible for:
- The maintenance and repair of the underground water mains, storm and sanitary sewers.
- The management of the high purity water vendor contract.
- The cleaning of obstructed sanitary drains in the all MGF Buildings.
- The operation of the Vactor Truck.
- The installation and repair backflow preventers located on the main water supply to each building.
- The installation, repair and maintenance of plumbing systems, as needed, in all University buildings.
- The response to after hours plumbing and service repair calls.

WHAT’S NEW FOR FY ‘06:
- During FY ‘06 we started the planning process for the purchase of a truck and associated equipment that will make it possible for camera inspection of the storm and sanitary sewer systems on the University of Michigan’s Ann Arbor Campus. The new camera equipment will allow us to better maintain the University’s underground sewer systems by inspecting for:
  - Broken sewers.
  - Identifying obstructions that have the potential to impede the flow of effluents.
  - The equipment has the ability to transmit a signal from the end of the camera in the sewer to a receiver above ground. This feature allows for precise location of the sewer piping when it must be uncovered to make repairs.
  - Cross connections between sanitary and storm sewer systems are common a problem and a major concern. The new camera system will be able to identify any cross connections that are present in the University owned sewer system. Once identified the problems will be able to be corrected.
- A new building to dry storm water sewage waste was funded by the Utilities Department to replace an existing waste drying pad on North Campus. The new structure was required by OSEH regulations. The new facility on North Campus will make drying the waste, efficient, safe and cost effective.
- The Plumbing Shop purchased a new machine that streamlines pipe connections. This equipment creates a groove about an inch in from the end of steel and copper pipe. Once the pipe is grooved it can be joined together with a clamping and gasket system. This system is especially useful when welding or brazing is not feasible. The system is also a labor saver, which helps cut the cost of projects.

HIGHLIGHTS:
- Again this year all of the University’s storm water system, which represents miles of piping, was cleaned. In addition to cleaning the system, mosquito larvicide briquettes
were installed in each of the system catch basins. The purpose the larvicide is to kill mosquitoes, which in turn reduces the risk of West Nile Virus to the University community.

- A series of valuable training seminars were identified and scheduled. These seminars were conducted by vendors of plumbing supplies and materials. The seminar topics included:
  - testing of backflow preventers.
  - tank-less water heaters.
  - set-up and operation of the new grooving equipment.

- The monthly shop meetings have become more than just the obligatory monthly safety meeting. Information flows freely between members of the shop. The result is an informed team that understands shop operations and department priorities. This increased level of communication makes it possible for all members of the shop to feel part of the larger organization.

- The Plumbing Shop was involved in many of the new water meter installations that were necessary do to Ann Arbor City’s water meter replacement program.

Before and after pictures of the domestic cold water meters, backflow preventers and associated piping at the Auto Lab Building. The new piping and components were installed by the Plumbing Shop.

AREAS OF IMPROVEMENT:

- We have been able to improve the number of work request close-outs through regular meetings with individual staff members. This process also helps identify work requests that require additional resources (materials, additional shops, etc) to facilitate project coordination and timely completion of work.

- During FY ‘06 a number of defective underground isolation valves were replaced as a normal maintenance activity rather than in an emergency situation. This is also an area for improvement as we move into FY 07. By continuing to be pro-active in locating and replacing defective underground valves, in case of an emergency, the water main system will be able to be isolated in a timely and efficient manner.
Steamfitting and Pump Systems

The Steamfitting and Pump Shop is comprised of one Foreman, fourteen Journeyman Steamfitters and four Apprentice Steamfitters. The Shop’s Steamfitters are divided into two working groups: Steamfitting and Pump maintenance.

Steamfitters

- Installation and maintenance of radiators, fan coils, steam traps, steam valves, and high and low pressure steam systems.
- Steam heating coils, chilled water coils and condensate receivers (air and steam).
- Installation of steam ovens, autoclaves, steam tables, etc.
- Maintain and install gas lines, air lines, steam and condensate mains and branch lines, etc.
- Installing condensate receivers (air and steam).

Pumps

- Installation, repair, and replace vacuum pumps, chilled water pumps, sump pumps, sewage ejector pumps, hot water heating pumps, all circulating pumps, DI system pumps.
- Install and repair air compressors.
- Repair steam condensate pumps including air drives.
- Repair of pump seals, flanges, and gaskets.

WHAT’S NEW FOR FY ’06:

Fiscal year 2006 bought a number of new and interesting developments to the Steamfitting and Pump Repair Shop:

- Two new Apprentices were brought into the Steamfitting and Pump Repair Shop. The quality of our new Apprentices continues to impress their Foreman and the Journeymen. A lot of credit for this goes to the Apprenticeship Committee that evaluates apprenticeship candidates from within the University, prior to being selected for apprenticeships.
- A centrally located mini-welding fabrication shop was created in FY 05 in the basement of the Modern Languages Building. An extraordinarily efficient portable exhaust system is located in the fabrication shop to prevent welding fumes from entering the building. This centrally located small shop continues to be a great asset for the Steamfitting Shop.
- The “Pro Press” is a new pipe joining tool used to join pipe-to-pipe and pipe-to-fittings was purchased in FY ’06. It can be used to join copper pipe in dimensions from one half to four inch pipe. The primary advantage of using this tool is that it doesn’t require the use of a torch to heat the pipe and fittings.

HIGHLIGHTS:

- The shop’s four Apprentices are receiving valuable on the job training from the Steamfitter Journeymen. The Apprentices are being trained in all aspects of steamfitting, pump installation and repair. We are expecting the four Apprentices to become knowledgeable and valuable journeymen for the Steamfitting Shop.
• A valuable training seminar was conducted for the Steamfitting and Pump Shop by the J.O. Galloup Company in February of 2006. The seminar provided technical training for proper testing and replacement of mechanical pump seals. The seminar also included extensive discussion of various types of pump bearings, along with tips and techniques for testing and replacement.

• Crisler Arena received a new steam to domestic hot water heat exchanger. The sports teams that utilize Crisler Arena’s facilities will appreciate the hot water produced by the new system.

• The picture below represents condenser and chilled water pumps at the Palmer Commons Building. These pumps are only a few of the many that are now the responsibility of the Pump Shop due to the large amount of new construction on campus. These complicated systems make it essential for our crews to continue to receive high quality training.

AREAS OF IMPROVEMENT:

• To ensure fair distribution of overtime to shop employees, the Steamfitting and Pump Shop Foreman worked with the shop Union Steward to implement a more effective spreadsheet to track staff overtime usage.

• Multiple condensate pumping systems were replaced in FY ‘06. The replacement of these systems will reduce the number of the emergency service calls on the obsolete systems. Reliable operation of the new systems will result in enhanced customer satisfaction.

• Faded and deteriorated decals on the Shop’s trucks have been replaced. The new decals project a professional image to the university community.
Plant Operations
Facilities Maintenance- Roofs, Metal Shops & Elevators

FY 2006 Annual Report

Published: September 30, 2006

Reroof Project at the School of Education
Section I: Introduction

Fiscal year 2006 was tremendously challenging. We received salary funding increases this year after three consecutive years of general fund reductions and no salary funding to go with the annual salary increases. However, new space funding was received to cover new facility space. The campus continues to grow as our customers desire increased levels of service. Educating the University community as to our goals and limitations is part of our improved communication responsibilities.

Informational classes at Plant Academy educate participants as to Plant Operations’ goals, limitations and challenges. The latest class to be created is called Building Systems. This class covers the basic functions of all building systems, from air conditioning to plumbing to elevators to roofs. Dennis Krieg assembled the information regarding the roof and elevator portion and also presented with other Plant Operations staff members.

The Roofs, Metal Shops & Elevators enterprise consists of the Roofing Shop, Sheetmetal Shop, Weld Shop, Machine Shop, Millwright Shop and the Elevator Shop. We are a team within Facilities Maintenance in Plant Operations working together to support the mission of the University.

The U-M Elevator Shop is one of the largest private elevator service shops in the country, with eleven licensed mechanics and is responsible for over 450 pieces of vertical transportation equipment across campus. The shop administrator manages the Hospital elevator maintenance contract using an external vendor. Staff performs construction plan and specification review for all of the Ann Arbor campus projects, acting as the in-house consultant for the University. Flint and Dearborn campuses receive similar consultation services on a customer-pay basis.

The Roofing Shop manages over 4 million square feet of general fund roofing surface in addition to many other auxiliary building roofs on campus. Housing, Athletics, the Hospital and other auxiliary departments obtain roofing services on a limited basis. Much of this “customer-pay” repair work is sent to outside contractors although the Roofing Shop usually oversees the work. All new roof and reroof projects are handled by outside contractors with the Roofing Shop inspecting the work for conformance to codes, regulations, and University specifications. This shop also does customer-pay roof plan and specification review for Flint and Dearborn campus projects.

The Sheetmetal Shop, Weld Shop and Machine Shop all work to maintain, repair, or fabricate almost anything imaginable from metals. Work includes metal roof repairs, gutters, ductwork, hand rails and cat walks. Occasionally prototype parts are made for a researcher with an idea, hospital surgery tools are repaired, or obsolete parts are replicated for elevator component repairs.

The Millwright Shop repairs and assembles all sorts of equipment and components from fans to key board trays to office partitions. This shop is also involved with the Employees Working Out of Classification (EWOC) program. The EWOC Program has been developed to
introduce Building Services staff to various types of work in other shops and provides additional career growth opportunities. The Millwright Shop sponsors a portion of this program with six-month rotations of three or four people learning maintenance and repair skills. The Window Air Conditioner Maintenance Program is a very successful, customer-pay service performed by the EWOCs in the spring and summer months. This assignment provides EWOCs with hands-on experience with equipment and is an excellent opportunity for this group to build their customer service skills.

Each shop has their own mission statement and strategic plan in relation to Plant Operations’ goals and the University mission. All shops’ goals of additional technical training were met this year and will be discussed later under individual shop highlights. New goals will be addressed next year following the outcome of the B & F staff and customer surveys as well as the Denison staff survey.

Work load evaluations for all shops were performed in the spring and will be done again in the fall. The late January to mid March time frame tends to be the slowest time of year for work load in these shops. The fall time frame tends to have the most work backlog. A major goal of management is to right size each shop to effectively handle their respective work loads to meet customer expectations.

Dennis Krieg
General Foreman
Section II: Roofs, Metal Shops & Elevators Organization Chart

- Elevator Shop
- Roofing Shop
- Weld & Machine Shop
- Sheetmetal Shop
- Millwright Shop
Section III: FY 06 Financial Summary

General Fund

<table>
<thead>
<tr>
<th></th>
<th>Beginning Budget</th>
<th>Ending Totals</th>
<th>Remaining Balance</th>
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<td>($103,585)</td>
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The Roofs, Metal Shops & Elevators enterprise finished the budget year with a small overdraft of about $103,000 according to the report. However, $61,000 is to be moved via journal entry that did not happen before July 1. Therefore the overdraft was about $42,000. Total revenue for all shops increased from $6,691,418 to $8,184,085 as customer-pay work (Athletics, Housing, Hospital & Auxiliaries) continues to add to our work load.

The Fixed Price account finished with a small positive margin of $3,673.

Overtime worked this year by all shops combined was 5453 hours compared to 3236 hours for last year. Customer-pay overtime alone was 3471 hours, or greater than all the overtime worked totally last year. This additional customer-pay work increased revenue by over $300,000. However, general fund overtime increased this year as well which contributed to the deficit.

Section IV: Year-End Operational Highlights

Elevator Shop

Mission statement: The Elevator Shop strives to maintain and repair vertical transportation equipment, while providing immediate response to community requests in order to maintain safe and reliable operation for the students, faculty, staff and guests of the University of Michigan.

We support our mission by:

- Providing top-notch preventive maintenance on the equipment for which we are responsible.
- Performing repairs in a proficient, expedient manner.
- Responding IMMEDIATELY to any emergency situation.
- Addressing customer concerns in a professional, timely manner.
- Adhering to the rules and codes promulgated by our governing authorities.
- Being a resource of elevator and escalator information with Plant Department and the University community.

Since July 2005, we were forced to re-examine our PDA program as well as revise our mechanics’ route structure.
The PDA’s that were supposed to electronically track work were too time consuming, unreliable, and costly. They were returned to Network Services, who has been looking into more powerful units to meet the needs of our systems. Preventive maintenance work requests have been printed out for most of the year. At least we can track the work even though there have been several issues with the way FMS (Facility Management System) assigns the work to individual mechanics. We are trying to resolve the issues with Network Services.

The continuous construction of new facilities with additional elevators and dock lifts pushed the need to revise the “route” structure for each mechanic. This added work to the Work Control Preventive Maintenance staff by changing which elevator mechanic gets assigned to each work request.

**Vertical Transportation Conference for Colleges & Universities:**
Representatives from the Elevator Shop attended the Vertical Transportation Conference for Colleges and Universities, VTCCU, held June 20-22, 2006, at Georgia State University in Atlanta, GA. In addition to the Educational Sessions and the mini Elevator Product Trade Show the Organization voted to move forward with Incorporating as a Professional Organization. The Organization will be known as Elevator U and will be incorporated in the State of Georgia. The By-Laws are under review at the present time and will be forwarded to the Current Mailing List of the VTCCU. Our own Ms. Terri Emmons, Administrative Associate for the Elevator Shop was elected President of this new organization. The purpose of Elevator U will be to support and encourage the exchange of ideas and information relative to vertical transportation in academic, municipal and governmental facilities.

There is already discussion as how to bring more technical training to groups instead of sending individuals around the country to receive the same technical training and code updates. This could save significant travel and lodging expenses while expanding the educational opportunity for more participants.

Fiscal year 2006 included the following highlights:

- John Miller, new elevator mechanic apprentice, started April 24, 2006. John was a maintenance mechanic at the Hospital, and an EWOC earlier in his career with Building Services.

- The hospital elevator maintenance contract was renegotiated with Otis Elevator. A three year agreement with two extensions of one year each was inked. A 3% annual savings was agreed to in exchange for annual up front payments tied to performance requirements for the equipment. This is a win-win contract for all.

- A renewal of the hospital escalator maintenance contract is currently being negotiated with Kone Elevator Company. Additional performance measures are being added to improve equipment reliability and increase customer satisfaction.

**Areas of Improvement**
A new data slip that logs equipment maintenance and repairs was designed to capture more complete information than its predecessor in a check list style for improved staff efficiency and more complete information transfer. This new informational check list reduced some of the manual information transfer chore for the shop administration.
Maintenance and repair information is to be maintained in a log in each machine room according to Michigan State codes. Staff members designed a new informational sheet to assist in this code requirement. The new sheet is easier to write on and read. It has check boxes instead of mostly blank lines for written information, as well as a few blank lines on which to add comments. The form has two carbonless copies. The top sheet gets returned into the office with the information being transcribed into our Facility Management System for reporting out later. The second copy gets put into the Maintenance Log Book which is maintained in each elevator machine room. This way any mechanic has access to previously recorded repairs and maintenance to assist with any future troubleshooting issues.

The Elevator Shop has been working on a “Business Plan,” which is our term for strategic plan, since 2002. This makes it easy to incorporate the Denison staff survey results and the B & F survey results into the plan where necessary to set additional shop goals regarding communication issues, work load and training.

The Elevator Replacement Model shows over $200 million in replacement costs for elevators in general fund buildings at today’s costs. The average life expectancy of an elevator is 23 years. If each elevator was replaced after an average of 23 years of use, $8.7 million would need to be spent each year to replace old equipment. One to two million dollars is being spent each year on elevator replacements, which is less than one-fifth of the funds needed yearly.

Although the Elevator Shop prides itself in keeping old equipment running, there may come a point when some obsolete parts can no longer be obtained or fabricated, even in our own machine shop. The current shortfall for elevator replacements is seven to eight million dollars annually. Unfortunately, the “area of improvement” is in the reports and replacement model that now show the current funding challenges.

**Millwright Shop**

*Ed Wilson, Foreman*

**Mission Statement:** To maintain comfortable and efficient environment/facilities for the students, faculty, staff and researchers of The University of Michigan.

The Millwright Shop provides the following services to the University community:

- Maintain and repair all types of fans
  - Supply fans.
  - Exhaust fans.
  - Return fans.
  - Fume hoods.
  - Cooling tower fans.
- Troubleshoot, repair and replace electric motors.
- Repair cooling towers.
- Office furniture and equipment installation & repair.
- Repair auditorium and classroom seating.
- Repair window springs, latches, and handles, etc.
- Repair and replace loading docks.
- Lockers repaired.
• Mechanical blackboards and projection screens repaired.
• Window air conditioner maintenance program.

The Millwright staff is now performing preventive maintenance on dock lifts and dock levelers. Occasional greasing and oiling was performed, but not tracked. The Facilities Maintenance PM crew inventories the lifts and levelers while assigning equipment numbers to those without identification. A preventive maintenance schedule is formed in our FMS to be assigned at predetermined intervals. Some of this maintenance is now being accomplished by EWOC’s who are upgrading their skills and preparing for promotion opportunities.

During FY 06, the EWOC program expanded to include other types of customer-pay work. Several of the window air conditioners they maintained were removed when Public Health I and the Business School administration buildings were razed. Other machine room areas and electrical substation rooms are now the focus of their attention.

Work load was indicated in the staff surveys as being an issue. A review of the work request backlog, new orders and preventive maintenance work load were analyzed in the spring and will be analyzed again this fall for changes. The spring analysis showed a minimal backlog at the slowest seasonal time of year. Plenty of work existed and a continuous flow of new work requests were incoming. However, the entire shop staff agreed there was not sufficient work at that time to justify the hiring of additional staff. Occasional overtime work seemed to be the answer for some of the work load peaks.

One area of little notoriety is the Millwrights’ responsibility for maintaining the flags and poles on the central campus Diag and outside the Plant Director’s office. The flags were lowered to half-staff and raised 39 times this past year to honor our country’s deceased by order of the Governor or President.

Areas of Improvement
Office and shop areas were reorganized this year for increased efficiency. Ed Wilson was new to the foreman position one and one-half years ago. Ed quickly developed ideas of his own to improve the office and shop areas. The Millwright Shop used to stock all the V-belts that MStores actually sold. This was due to the Millwrights installing most of the belts on campus as well as having the wall space available for storage. Stores stocks the belts in their area now which promotes greater accountability when other University staff need the same materials. Stores is accountable now for the correct ordering of replacements and billing out of sales.

Roofing Shop

John McCallum, Foreman

The mission of the Roofing Shop is to repair, maintain and replace roofing systems to provide a watertight environment for safety and comfort of the students, faculty and staff of the University of Michigan.

We provide complete roofing services consisting of:
• Repairs to any type of roof system.
• Re-roofs from tear-offs to recover.
• New roofs of any type (shingles, slate, tile, rubber, metal, built up, single ply’s of any type, etc.).
• Inspection service for existing roof condition, survey included, during construction inspection of new work and re-roofs.
• Survey includes present condition, test cut information of the system, deck type and building roofing history.
• Water proofing above or below grade as well as inside building.
• Installation of new mechanical units on existing roofs.
• Cleaning of roof drains, roof gutters, and downspouts prior to the winter season.

One roofer, Pat Monaghan, had over 39 years of service at the University when he retired in January, 2006. Another roofer, Bob Brabo, has been on a phased retirement for two years. He is scheduled to fully retire in December of this year with over 32 years of service to the University. A third roofer, Ron Hansen has been granted phased retirement beginning in January, 2007. Ron has over 30 years of service to the University. Two of the other three roofers are eligible to retire at this time.

The roofing shop continues to increase business to outside contractors to supplement the work load. (See graph: “Operational Budgeted Roof Repair Expenditures by Outside Contractors”). Outside contractor repairs leveled off this year from previous years due to the administrative work load necessary to put such work into place.

A problem or issue must be identified by an incoming work request from a customer. The issue must be investigated by in-house staff as to the extent of the problem and after discussion with the customer regarding facility history. A specification is put together and a walk-through scheduled with outside contractors. Bids are evaluated, a purchase order issued, any necessary facility shutdowns scheduled, key access provided to the roof, and the work completed. Work completion is verified and authorization issued to pay the contractor.

Many water infiltration issues are related to walls, windows, skylights, and plumbing for roof drains. This work must also be investigated and sent off to the appropriate shop or contractor for correction.

The past two years of expenditures have shown that outside contractor support is at an upper limit with the current shop and administrative support available. It has also been shown that as more roof inspections are performed across facilities, even more necessary repairs are identified. The work load increases even more under these circumstances. Increasing roofing preventive maintenance reduces water infiltration issues in the long run.
Areas of Improvement
The office and shop areas were reorganized for increased efficiency and additional document storage regarding roof replacements and new building roof installations.

Roofing staff performed 725 hours of overtime this year compared with 328 hours last year. Roof inspection work requests are increasing as the struggle between being proactive with inspections and responding to problem leak calls overfills the work schedule.

The Roof Replacement Model shows over $76 million in replacement costs for general fund building roofs in today’s dollars. Replacement roof expenditures have been in the one million dollar range annually. The average life expectancy of most campus roofs is 15 to 20 years for the rubberized single membrane EPDM. Metal roof life expectancy is closer to 40 years, and slate roofing is in the 75 year range. Renovation projects that involve new equipment installations on roofs drastically reduce the life expectancy.

Using an overall average roof life of 25 years, three million dollars should be spent replacing roofs annually. Current and previous funding has been one million dollars or less each year. While it is possible to continue placing patches on patches to a certain extent, dry rot, shrinkage and cracks eventually overtake the entire surface. The roof is what protects all the other equipment and contents (including elevators) of any facility.
Sheetmetal Shop

**Ralph Rose, Foreman**

Mission Statement: The Sheetmetal Shop supports Facilities Maintenance and Plant Operations in providing the University community with the highest quality customer service and superior craftsmanship to maintain a safe and comfortable physical environment.

Heating Service
- Install and service gas fired forced air furnaces and heating units.
- Install and service gas fired water heaters

Sheetmetal Shop
- Precision CAD-CAM sheetmetal fabrication and installation
- Fabricate, install or repair architectural, structural or ornamental ferrous and non-ferrous metals such as: duct work, grills, louvers, dampers, machine guards, gutters, flashing, tanks, cabinets, boxes, ventilators, window air conditioners, filter housings, roof vents, sinks, lab hoods, shelving, light fixtures, specialty medical equipment or anything made out of metal.

Heating Service training was expanded this year to include additional staff. Rooftop heating units are being added to facilities which will require additional service personnel.

We are particularly proud of Apprentice Clint Fink who is completing his apprenticeship in Fall 2006. Clint has done very well with the schooling and his workmanship is outstanding.

Areas of Improvement
Heating Service preventive maintenance is in the limelight this year. The PM has always been performed, but now preventive maintenance work requests are added to the FMS system for improved tracking and reporting. The increase in rooftop heating units on campus has created a work load and training issue for the sheetmetal shop as a “right-sizing” exercise is performed to validate staffing requirements.

The addition of a Work Control & Project Coordinator last year greatly improved customer and inter-shop communications. Work requests are updated more frequently with more pertinent information. Customers are more informed as to project and repair statuses. However, based upon the B & F customer survey results, additional improvements can still be made.

Weld & Machine Shop

**Randy Ramsey, Foreman**

Mission Statement: The Weld Shop’s mission is to maintain and improve a safe and efficient environment for the campus community area through specialized projects and needs in all aspects of metal fabrication.

Weld Shop
- Provide assistance in design and fabrication for prototype or research projects and specialty items
- Repair or replace all interior and exterior metals as needed due to damage, weather or wear
- Repair, reconstruct or fabricate kitchen or medical equipment
- Install rigging beams and walkways to aid in gaining or improving access
Machine Shop

- Design and fabricate metal and plastic precision and specialty parts and machinery components such as:
  - Student solar car project
  - Student future car project
  - Historical or obsolete components as in the Burton Bell Tower clock mechanisms and the Observatory telescope restoration

All Weld Shop staff earned AWS (American Welding Society) structural welding certifications this year in areas they were not previously certified for. This was a staff driven training issue listed in their business plan goals.

As happens every year, the Weld Shop received some last minute work at the Football Stadium to be completed before the first game. The removable bleacher section that covers the tunnel entrance was replaced with all new materials and structure. These additions had to be fit to match the new steel and concrete already put in place during the summer months by outside contractors. Everything turned out great!

Areas of Improvement

The Weld Shop recently received a new steel storage rack for incoming materials. The current receiving and shipping area has been redesigned for a more efficient material flow. When completed, the area will promote more efficient material handling while more fully utilizing the existing chainfall/hoist system. The ergonomic advantages of this improvement should also reduce staff injuries.
Plant Operations
Facilities Maintenance - Training & Apprenticeships

FY 2006 Annual Report

Published: September 30, 2006

Apprentice Ben Zick (center) helping out with the Electrical Construction crew electricians Ted Hayman and Ty Cole.

Note – all photos by Chris Nedrow unless otherwise specified.
Section I: Introduction

It has been a fruitful year for the Facilities Maintenance Training & Apprenticeship program. The Training & Apprenticeship Coordinator ended his term as the Interim Manager of Plant Academy when a new permanent Manager was hired in July 2005. After assisting with a brief transitional phase, he was able to return his full focus to the FM Training & Apprenticeship function. However the collaborative spirit established between the departments has continued unabated, as witnessed by the Training Coordinator’s participation as faculty for the Institute for Facilities Maintenance program, the Plant Operations Orientation program, the Practical Supervisor Program, and the Plant Academy Coordinators (PAC) Team.

Facilities Maintenance has taken an active role in developing a comprehensive Training Administration Compliance System (TACS) for all of Plant Operations. The TACS team has customized and populated a web-based, computerized learning management system called LearnerWeb, which was rolled out in FY 2006. This project is discussed in more detail in the “Year-End Operational Highlights” section.

The Skilled Trades Apprenticeship program remains robust. Eight new apprentices were added to the program; five of whom were directly supported by supplementary funds earmarked for apprentices to replace retiring skilled trades workers. At year’s end, we had twenty-two apprentices, and anticipate three more to start in September, bringing us at least momentarily to a new all-time high of twenty-five. We hope to sustain this upward momentum throughout the coming fiscal year.

Tom Sullivan
Training Coordinator

Apprentice Gordon Collett working under the watchful eye of Eddie Adams of the Electrical Technical Shop.
Section II: Facilities Maintenance Training

Facilities Maintenance Training

Training & Apprenticeship Coordinator

Temporary Training Assistant

Section III: FY 06 Financial Summary

The Facilities Maintenance Training operations budget is comprised primarily of salaries and benefits for the Training & Apprenticeship Coordinator; the part-time Training Specialist Associate; temporary staffing; a portion of the OSEH representative’s compensation for safety training services; and the labor costs of employees attending the Facilities Maintenance Safety Committee and the Joint Apprenticeship Committee meetings and selection interview panels.

Expenditures ($149,316) were slightly under budget ($151,212) for a modest surplus of $1,895 (1.25%). Of note was an improvement of $5,354 from the previous year in spending on Plant rebilled labor and materials, a function of Apprenticeship Committee and Safety Committee labor costs.

For FY 2007, we anticipate reduced Compensation costs due to the transfer of the remaining 20% of the Training Specialist Associate’s effort to Plant Academy effective April 2006, and by rebilling the Hospital Facilities Maintenance service contract for 20% of the Training & Apprenticeship Coordinator’s salary, effective July 2006.
Section IV: Year-End Operational Highlights

Training & Apprenticeships Tom Sullivan, Training Specialist Senior
At the start of the year, the Facilities Maintenance Training unit was comprised of one full-time Training Specialist Senior, supplemented by 20% of the services of a Training Specialist Associate on a split assignment supporting Building Services (40%) and the TACS project (40%). Effective April 2006, the remaining 20% of the Training Specialist Associate’s effort was transferred to Plant Academy and a temporary Training Assistant was hired to assist with the TACS project implementation and other scheduling duties.

Apprenticeship Program
Plant Operations has identified the replacement of journeypersons with apprentices as an area for meeting budget reductions, as apprentices earn a graduated percentage of the journeyperson rate. During FY 2006, we were fortunate enough to receive revenue to support five supplemental apprentice appointments to meet needs anticipated by projected retirements of skilled trades workers. Eight new apprentices were added to the program in FY 2006, bringing the number of active apprentices to twenty-two as we start the new fiscal year. The new apprentices are:

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<th>New Apprentice</th>
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<th>Department</th>
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</thead>
<tbody>
<tr>
<td>Jeremie McCoy</td>
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<td>Facilities Maintenance/ UPE</td>
</tr>
<tr>
<td>Denice Johnson</td>
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<td>Facilities Maintenance/ UPE</td>
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<td>Mike Kinnard</td>
<td>Plumber</td>
<td>Facilities Maintenance</td>
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<tr>
<td>Aaron Pollack</td>
<td>Steamfitter</td>
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</tr>
<tr>
<td>Chuck Shepard</td>
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</tr>
<tr>
<td>Jason Hackbarth</td>
<td>AC and Refrigeration</td>
<td>Facilities Maintenance</td>
</tr>
<tr>
<td>John Miller</td>
<td>Elevator Mechanic</td>
<td>Facilities Maintenance</td>
</tr>
<tr>
<td>Kevin Kelley</td>
<td>Carpenter</td>
<td>Construction Services</td>
</tr>
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</table>

A new air conditioning and refrigeration apprentice and two new electrical apprentices are due to start in the 1st quarter FY 2007, which will bring us to a new peak of 25 since a relative low of 12 active apprentices at the end of FY 2002.
In January, a dinner was held to honor the nine apprentices who completed the program and received promotions to Journeyperson status in 2004 and 2005. These nine highly-skilled tradespersons have proven their abilities during the course of their apprenticeships, and we expect that they will make great contributions in their respective crafts over the course of their careers. The apprentice graduates are:

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<th>Graduating Apprentice</th>
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<td>Bradley Greenfield</td>
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<td>Richard Lewis</td>
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<td>Facilities Maintenance</td>
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<td>Keith O’Neil</td>
<td>Welder</td>
<td>Facilities Maintenance</td>
</tr>
<tr>
<td>Tom Hunget</td>
<td>HVAC Mechanic</td>
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<td>David Hawks</td>
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<td>Jason Miller</td>
<td>Plasterer</td>
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<tr>
<td>Brian Luttermoser</td>
<td>Industrial Electrician</td>
<td>Hospital Facilities Maintenance</td>
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<tr>
<td>Karen Sells</td>
<td>Telecommunications</td>
<td>ITComm</td>
</tr>
<tr>
<td>Don Paschal</td>
<td>Sheetmetal</td>
<td>Facilities Maintenance</td>
</tr>
</tbody>
</table>
The Joint Apprenticeship Committee (JAC) continued with our streamlined selection process and interviewed 45 candidates for apprenticeships. We are reaping significant savings in time and costs for the selection committee having one annual posting period rather than separate postings for each opening.

There were a few changes in the composition of the Joint Apprenticeship Committee. Long-term members Ken Easley and Joe Mahler passed the baton to Ivory Sims and Gary Anderson. The committee is grateful for their exuberant participation and many contributions to this worthwhile employee development and succession management program.

The Apprenticeship Program is entering the fifth and third years respectively in our groundbreaking arrangements with the IBEW Local 252 and the UA Local 190 to provide the classroom training for our electrical, plumbing, steam fitting, and HVAC apprentices. These two locals are widely recognized as premier programs in the country for the quality of their apprentice training schools. These arrangements with the Locals’ training facilities have strong support of foremen, inspectors, and tradespersons who recognize the ability of these programs to provide training that is highly specific to each trade.

Craig Bentley gives Steamfitting Apprentice Aaron Pollack a bit of guidance. — AC Refrigeration Apprentice Jason Hackbarth getting in some serious wrench time.

**BOMI Certification**

An exciting new development this year is the agreement with Washtenaw Community College to offer on-site, for the convenience of our maintenance mechanics, five semesters of BOMI Systems Maintenance Technician certification courses. These courses are sanctioned by the Building Owners and Managers Institute (BOMI), an internationally recognized leader in commercial property education, and will begin in September 2006 and run through April 2008. Our employees will study *Electrical Systems and Illumination; Refrigeration Systems and Accessories; Air Handling, Water Treatment, and Plumbing Systems; Boilers, Heating Systems, and Applied Mathematics; and Energy Management and Controls*, and will learn how to maintain energy-efficient and cost-effective building systems. Successful participants in these programs will receive 10 college credits in addition to the SMT certification as maintenance professionals.

**MECH Certification Testing Program**

We continue to proctor bi-annually the Michigan Education and Certification for Healthcare exams for the Hospital Maintenance staff. This year, three Plant Hospital Maintenance mechanics – Joe Hovorka, Phil Mullaly, and William McKinney - passed the exam at the Senior Certified Level. The MECH designation is widely recognized and respected throughout the State.
of Michigan as a competency certification for Healthcare Mechanics. It is achieved by mechanics only after passing a rigorous examination covering the following categories of Healthcare Maintenance work designated as critical skill areas by an expert panel of working Healthcare Mechanics:

- Plumbing and Pipe Fitting
- General Facility Maintenance
- HVAC/Refrigeration
- Grounds
- Carpentry
- Electrical and Electronics
- Boiler/Power Plant
- Safety and Support Services

In addition to passing the standardized test, an integral part of the certification is the years of experience acquired working in a healthcare environment: 2 years for the Certified designation, and 4 years for the Senior Certified designation.

The next administration of the exam will be during the 1st quarter of FY 2007.

As an added service to the Zone Maintenance department, we have begun a new program of administering the MECH entry level skills assessment for Campus Maintenance Mechanic candidates. This skills assessment helps to quantify the mechanical skill level of applicants and has been lauded by the Zones Business Manager as a valuable tool for the selection committees.

**Renewed Efforts in Safety Awareness**

Facilities Maintenance continued with robust safety training offerings this year, including the Annual Safety Refresher training; New Employee Safety Orientation; Ballast/ Electrical Safety program; and MRI Safety, as well as others listed below in more detail. In addition, we purchased additional Safety DVDs to augment our library. We now have 72 safety DVD titles to assist foremen with their shop safety meetings. These are complementary to the OSEH – provided Monthly Safety topics.

**High Voltage Safety Training**

A major safety training initiative for the Electrical Shops was undertaken this year by providing a 30 hour *Electrical Safety for Industrial Facilities* training class for high-voltage electricians, foremen, and electricians in the high-voltage cross training program. The objectives of this course, presented by an AVO Training Institute trainer over three and one-half days, are to enable the participants to work safely around metal-clad switchgear, industrial substations, motor control centers and facility electrical systems; use safe practices for working on or near energized and de-energized electrical systems; and to properly install temporary grounding for personal protection.
The presentation of a course of this length and level of detail reaffirms Plant Operations’ steadfast commitment to worker safety. By combining efforts with IBEW Local 252 in scheduling multiple sessions of this class, our department was able to provide this training for 32 Facilities Maintenance, Hospital Maintenance, and UPE electricians and foremen at a per person savings of over 50% of the cost of having the training onsite, and without interruption of service to the campus. These savings will continue into FY 07, as another 5 electricians and apprentices are scheduled to attend in the 1st quarter.

**Animal Safety Protocol Training**

With the addition of the Life Sciences Building and the Biomedical Research building, animal research laboratory space on the campus quadrupled, causing a much greater demand for animal safety protocol training. Furthermore, our customers have stated in a focus group that next to patients, animal lives are of primary importance. Hence, for their own protection and for the safety of the animals, forty-three maintenance service employees who need to enter animal research labs in the course of their jobs received this training in multiple sessions held this year.

**Confined Space Entry Safety Training**

Fifty-Seven Plant Operations employees received the full Confined Space Entry certification training in four sessions held this year, bringing the total of active employees with this training to two hundred eleven. An additional seventeen employees received refresher training on this topic in one of two sessions held this year.

Carpenter Apprentice Kevin Kelley and Chris McCarthy repair water damage at CCRB.
Technical Training Programs

Because of ever-changing technology and the increased complexity of building systems, technical training sessions are frequent and too numerous to mention here. However, there were several training efforts across a wide variety of shops and specializations this year that are noteworthy examples of the types of training provided. These include Portable Generator Operator training and field testing; Victaulic-Permalynx “Snap-to-Fit” Fittings; Mechanical Seals and Bearings training; Ridgid Groover training; and Preventive Maintenance Training for the Electrical Technical Shop.

Technical training already planned for the 1st quarter of FY 2007 includes training in Microprocessor Fire Pump Control Panels; Kitchen Fire Suppression System Servicing; and DOT Hazmat & Fire Extinguisher maintenance, hydrotesting, and recharging for the Fire Extinguisher & Fire Protection shops.
Building Systems Owner Training for New Construction

Extensive new construction on the campus has provided us with opportunities to provide owner operation and maintenance training on new building mechanical, electrical, and architectural systems. This system training gives our service technicians and opportunity to stay abreast of new technology. The cost of providing this training is included in the construction project. Noteworthy projects this year included Biomedical Science Research Building; the Arbor Lakes Parallel Computing Center; the Ambulatory Surgery Center; the Undergraduate Science Building; Computer Science and Engineering Building; and the Perry Building.

Coaching, Positive Discipline, and Grievance Handling Training

The Practical Supervisor series is a certification program, sponsored by Plant Academy, on the “nuts and bolts” of critical performance areas for Plant Operations Supervisors. Facilities Maintenance Training has collaborated on a module entitled A Supervisor’s Guide to Coaching, Positive Discipline, and Grievance Handling. This module centers on how to use a positive, productive approach to dealing with performance problems, and will serve as both a guideline for new supervisors and a refresher and information exchange for experienced ones.

Participants will learn:

a. The various types of misconduct and the appropriate corrective actions
b. To encourage employees to take ownership of performance problems and their solutions
c. To identify, investigate, and document work performance problems
d. About their role in the grievance process

The Practical Supervisor will be launched for all Plant Operations supervisors in September.

Digital Dashboard Project

In support of Plant Operations goal of becoming a data-driven organization, a multi-function team of Plant Operations employees have been working to develop a digital dashboard. A digital dashboard provides a single location to view business-related metrics known as key performance indicators or KPIs. These KPIs are presented in a real-time, easy to access “dashboard” that has been customized for each department to keep the most important business information at the user’s fingertips. Timely monitoring of KPIs that deviate from the norm can help managers get to the root of and correct problems quickly. The Training & Apprenticeship Coordinator is involved in both the dashboard development and the training plans for this project, to be rolled out in the first quarter 2007.

Customer Service and Communication Training

In response to issues identified in the Business and Finance Customer survey and subsequent customer focus groups, a team of General Foremen, work control coordinators and other staff are working together to design a Customer Service training class, primarily but not exclusively for front-line maintenance and trades employees. This highly interactive course will include discussion of challenges to clear communication with customers and an expected communications protocol to ensure that front-line staff keep customers posted on work order
progress. This is especially critical when work is “handed off” from one shop to another for completion. This training is expected to commence in October.

**Training Administration & Compliance System Project**

The Facilities Maintenance Training function has continued to serve an essential role in the Training Administration & Compliance System (TACS) project. The Training & Apprenticeship Coordinator and the Temporary Training assistant are serving as the TACS representatives for Facilities Maintenance, Hospital Maintenance, and U&PE.

This project has been tasked with developing a web-based learning management system for Plant Operations Employees to help supervisors identify and prioritize training needs, in order to more effectively allocate training resources and ensure compliance with regulatory training requirements. The end product will allow training to be targeted to the knowledge and skills required for competent job performance.

Learner Web Training of Plant Operations managers, supervisors, and support staff was completed in the winter, and training for new staff is ongoing on a one-on-one basis. Another major milestone was the completion in the spring of a Plant-wide employee self-assessment of skills, as identified by the DACUMS. The data gathered from this self-assessment will be analyzed to help target training needed as identified by the employees’ perspective. The analysis of this data gathered in the skills assessment poses a real challenge due to the sheer volume of data – the Facilities Maintenance report alone has over 32,000 lines.

Our next steps include the development of employee learning tracks, another challenging prospect due to the large number of distinct job classifications and the relative complexity of the Facilities Maintenance skilled trades and service maintenance staff training needs. Identification of the learning tracks and rollout of the student module are both to take place in fall 2006.
Practicum Project: Mapping of Machine Rooms
Section I: Introduction

Zones continued to grow during FY 06 by expanding from six Zones to nine Zones. The new Zones are M2900 – the Life Science Zone and M2050 – the Fire Extinguisher Inspection Group. North Campus Zones was split into two Zones – M2200 and M2250.

The transition of the Electronics Alarms, and Radio Shop into the Zones was a smooth one, and proved to very helpful in managing the Zone budget. The plumbers and electricians in M2001 were used to support the Zones, as well as other shops when vacancies or support was needed.

This year is the second consecutive year that the overall number of corrective work orders for the Zones has been reduced. Considering the number of new buildings and additional square footage we are maintaining, it is evident the preventive maintenance (PM) program is working. We simply are not experiencing the types of unscheduled failures we have in the past.

This year we also improved the percentage of PM completions, in nearly every Zone.

Jim Almashy
Business Manager
Section II: Zone Maintenance Organization Chart

Zone Maintenance

- Chemistry Zone
- Fire Extinguisher Shop
- LS&A Zone
- North Campus Zone
- Off Site Zone
- Dental School Zone
- Electrical Alarms & Radio Shops
- Life Science Zone
- Medical Zone
- North Campus Zone 11
- South Campus Zone
Section III: FY 06 Financial Summary

General Fund

The Zones were 1.6% over budget ($137,739). I attribute this to the increased manpower needed in all the Zones. Much of the additional work force was needed in new buildings to get machine rooms cleaned and organized. The Med School needed an additional carpenter to address a tremendous amount of floor tile repair.

<table>
<thead>
<tr>
<th>Zone Maintenance General Fund Budget FY 06</th>
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<tr>
<td></td>
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<tr>
<td>Labor</td>
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<td>Material</td>
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<tr>
<td>Total</td>
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Section IV: Year-End Operational Highlights

As stated earlier, the current PM program is making a significant difference in the amount of corrective repairs and catastrophic failures that we’ve experienced in the past. This year the Zones as a department completed 91.9% of the assigned PM work, that’s a 4.71% increase over FY 2005

<table>
<thead>
<tr>
<th>PM Completion Rate by Zones</th>
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<tbody>
<tr>
<td>M2100 South Campus</td>
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<tr>
<td>M2200 North Campus</td>
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<tr>
<td>M2250 North Campus II</td>
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<tr>
<td>M2300 Medical</td>
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<td>M2400 SPH &amp; Dental</td>
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<td>M2500 LS&amp;A</td>
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<tr>
<td>M2600 Chemistry</td>
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<tr>
<td>M2900 LSI</td>
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I am extremely pleased with the efforts of all Zones Shops. I am confident as Work Control continues to refine this program that correctives will continue to be reduced, allowing more time for machine room, and equipment maintenance.

Chemistry Zone, M2600 Ron Sweeney, Foreman
The Chemistry Zone is a 14 man shop with four skilled trades, nine AFSCME, and one EWOC. This group is responsible for approximately 2,247,363 square feet of classroom and laboratory.
During FY 06, the Thayer St. building was completed, and is now partially occupied. This year will mark the end of the Frieze building. All the occupants should be out of the building by the end of the year.

Areas of Improvement:
The Chemistry Zone made significant improvements in almost all of their Performance Measurement Reports, especially in Turn Around Time, and PM Completions. They made these improvements while reducing their annual shop overtime.

Electrical Alarms & Radio Shops, M2001  
Tom Metty, Foreman  
The Alarm Shop is divided into three distinct groups: electronic and radio repair; fire alarm testing and repair, and; mechanical fire pump testing, valve inspection, and fire piping repair. Much of the work is mandatory testing of fire alarm systems for Housing dormitories.

This shop has been extremely busy this fiscal year with the testing and inspection of new buildings. BSRB, Computer Science, and USB are just a few of the major new buildings completed. The shop experienced a complete make over thanks to the demolition of the Business School, all “new” desks, chairs and work stations were installed, bringing the shop into the 21st century.

Areas of Improvement
NFPA mandates that every building fire alarm system be inspected and tested annually. This year we will focus on improving our fire alarm testing programs. With the addition of so many new buildings on campus, and the emphasis on not hiring more staff, we need to take advantage of technology within each of the new fire alarm system. This year the department came in under budget, by placing a limited number of our work force with other Zones when needed.

Fire Extinguisher Shop, M2050  
John Hirsch, Supervisor  
This unit is tasked with the inspection of over 10,000 fire extinguishers on campus. The group is managed by John Hirsch with the support of Alissa Weber.

Since July 1, 2005 we have been struggling to get U of M students to participate in the inspection program. Our first U of M student started with us in June of 2006, and a few more are scheduled to start this year. We are hopeful to find a U of M student qualifying for the Work Study Program. John Hirsch, his temporary staff, and students have been able to inspect over 80% of the fire extinguishers in every General Fund building on campus, every month. Access to secured spaces is preventing the department from reaching their 100% goal.

Areas of Improvement
The department plans to expand into a number of different areas. The first will be the inspection, testing, and certification of Ansul Fire Suppression hood systems. Another will be to develop emergency evacuation plans for all buildings, showing the locations of all the fire extinguishers, on each floor.
Life Sciences, M2900  
Jim Barnes, Foreman  
M2900 is a new Zone with the following buildings; Life Science, BSRB, Commons, USB, and School of Public Health 111. The Zone is unique with approximately 1,140,000 SF of new lab and research space. This Zone is the trend setter for all other Zones, as far as how PM is performed, and how corrective work is distributed equally amongst the staff.

The Life Sciences machine rooms are an example of how we would like the entire University to look and function over time. During FY 06, BSRB opened and is presenting some real new building challenges to our staff. Numerous losses of power were experienced on the 5th floor finally determined to be due to an 800 amp circuit breaker with over sensitive trip settings. Similar problems are being experienced with larger substation breakers, and the emergency generator.

M2900 led the Zones in PM completions with 98.40%. A key component to successful management of new buildings is for staff to understand how all the new systems within the building work, and to confirm that they work as designed. The staff has done an excellent job in confirming the buildings systems do just that. The group has discovered deficiencies mechanically, architecturally, and electrically that will be corrected through the construction warranty program.

Areas of Improvement
One area of improvement is the validation of the ISES reports. Confirmation of time, material cost, and frequency of preventive maintenance is critical in validating the report. This will insure we are being funded adequately for our services.

LS&A Zone, M2500  
Chuck London, Foreman  
The LS&A Zone shop consists of 4 skilled trades and 9 AFSCME maintenance mechanics. The primary mission of the Zone is preventive, and corrective maintenance, and Special Events. The Zone is approximately 2,145,878 square feet of class room space.

During FY 06, the LS&A building renovation was completed and is now fully occupied. This was another successful year of coordinating over one hundred special events ranging from Art Fair to both Winter and Spring Commencements.

Areas of Improvement
M2500 continues to find new ways to save the University special events dollars. This year a permanent 3 phase 100 amp circuit was added north of the 18th green at the golf course for tail gates. In the past a generator was rented, and at least one mechanic was paid overtime for the entire event. Now, the only requirement is to turn power on/off at the start/end respectively.

Medical Zone, M2300  
Gerry Heath, Foreman  
The Medical Zone is a 12 man crew with 5 skilled trades. They maintain approximately 1,639,086 square feet of laboratory, and class room space. This year with the opening of BSRB many new challenges were encountered with the moving of occupants throughout the facility.
The Med Zone is one of the smaller square foot zones, but historically has more work orders generated than any other Zone. This year was no exception. The PM team completed 92.6% of their required PM work - a significant increase over last year.

Areas of Improvement:
Uninterrupted utility service is critical for research in the Medical School. It is also unavoidable for the Med School PM team. In order to provide the required PM, systems must be turned off periodically. By adjusting staff shifts, and working more closely with lab personnel, many of the shutdown issues have been resolved. This year the PM team completed 92.6% of the required PM – that’s up from 75% last year.

**North Campus Central Zone, M2200**
Doug Good, Foreman
M2200 maintains 1,175,480 square feet with 4 skilled trades and 4 maintenance mechanics. The focus in this zone like all others is preventive and corrective maintenance. This year the group completed 94.48% of the required PM work.

Since July 1, 2005, M2200 has undergone some significant changes. They now maintain 1,175,480 square feet with 4 maintenance mechanics, and 4 skilled trades. Last year before the Zone was split, the group maintained 2,859,450 square feet with 18 men.

Areas of Improvement
The biggest area of improvement with the Zone split will be developing more one-on-one relationships with facility managers and customers on North Campus

**North Campus II Zone, M2250**
Joel Foos, Foreman
Zone M2250 is the second half of M2200. This zone maintains 25 buildings totaling 1,683,970 square feet of lab and class room space. There are 6 maintenance mechanics, and 3 skilled trades working out of the shop. The mission of this shop is preventive and corrective maintenance, and the coordination of small electrical construction projects on North Campus. The shop is located in room 2912 of the Computer Science Building

Joel Foos is the new manager of the M2250 Zone. Joel’s transition from electrician to supervisor has been seamless due to his previous experience as lead man and temporary supervisor.

Areas of Improvement
The greatest area of improvement is the result of subdividing Zone M2200, formerly a zone with more than 3 million square feet. With the creation of Zone M2250, we have been able to build upon and improve our one-on-one relationships with building facility managers.

**Off Site Zone**
Jeff Bolgos, Supervisor
The E.S. George Reserve consists of approximately 1400 acres and is located near Pinckney, Michigan. The Museum of Zoology is the primary user of the property and Plant Operations is responsible for the maintenance of roads, fences, and buildings on the site. In addition, the Fresh Air Camp, a 172 acre parcel, is located adjacent to the E.S. George Reserve. Radio Astronomy,
the W.U.O.M. Radio Transmitter, Newcomb Tract, and Stinchfield Woods are also part of the off-site properties.

Since July 1, 2005, we have learned the use of the 172-acre Fresh Air Camp may be changing. The University of Michigan Hospital, and the Michigan Union have shown interest in the property and are exploring potential new uses of the site.

Areas of Improvement
Overall the conditions of the buildings at the Fresh Air Camp must be addressed. With the exception of the Dining Hall, the remaining buildings have reached the end of their useful life and should be torn down and removed.

**South Campus Zone, M2100**
*Lee Lambarth, Foreman*
M2100 is a 12 person shop with 4 skilled trade, and 8 AFSCME employees. The primary mission of the group is preventive and corrective maintenance of 40 classroom and administrative buildings totaling 2,289,223 square feet, along with the coordination, and manning of small electrical construction projects on Central Campus.

Since July 2005, the Zone has seen the completion of the Perry School addition and the demolition of the William Davidson, Patton Center and Assembly Hall Buildings (Business School). The Zone has taken over responsibility for both the Executive Residence and Wyly Hall, also part of the Business School. M2100 continues to meet or exceed customer needs related to the small electrical construction projects throughout central campus.

Areas of Improvement
The shop has completed the emergency generator project as part of our Emergency Preparedness Program. The M2100 shop will be the command center for the Zones in the event of a disaster, or extended power outage.

**Dental Zone, M2400 (formerly SPH/Dental Zone)**
*Jeff Colley, Leadman*
The Dental Zone is approximately 1.6 million square feet of museums, office space, and student recreational facilities. The facilities are maintained with 5 AFSCME employees, 4 skilled trades, and managed by a lead mechanic.

With the addition of Shop M2900 (LSI Zone), the former SPH/Dental Zone was split. The School of Public Health was moved to M2900 to help balance the square footage responsibilities between these two zones.

Areas of Improvement
Many of the facilities in this zone are older, and most of the mechanical and electrical systems have reached the end of their life. In the Dental School, for example, we are working closely with Plant Engineering to replace the vacuum and suction system as well as the building drain piping. Since the Dental School was one of the first buildings on campus to be piped with the no-hub waste piping system, the Zone plumber and maintenance mechanics are constantly repairing or replacing sections of this system.