
Analysis of Facility Cost Savings Associated with Flat Panel Monitors - Update - April, 2003

This study was funded by grants from IBM, under the direction of James Tessier, LCD Flat Panel Monitor Segment Manager, and completed by Kingsland Scott Bauer Associates (KSBA), Pittsburgh, PA, in cooperation with Flack + Kurtz Consulting Engineers, LLP, New York, N.Y. The opinions and results expressed in this study are solely the responsibility of the authors. IBM is the registered trademark of the International Business Machines Corporation.

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Analysis of Facility Cost Savings Associated with Flat Panel Monitors

Abstract

This study is an update of the original research completed in November 1998 by KSBA Architects that explored the potential for facility operating savings through the use of *Flat Panel Monitors** (FPMs) in high-density, open plan office environments. The update was deemed necessary to include the recent significant price decrease of FPMs that dramatically reduced the cost premium to the equivalent *Cathode Ray Tube Monitors* (CRTs). The effort, however, is not confined to the monitors' capital costs, but rather re-examines assumptions and expenses to accurately reflect today's business environment.

FPMs continue to gain popularity for desktop PCs. Although FPMs are admittedly more expensive than the comparable CRT, they present three major advantages that may more than make up the purchase price difference by enabling significant facility savings. These advantages are:

- less space used,
- less energy used, and;
- superior quality images from a monitor that adapts better to a variety of lighting conditions.

The study addresses four potential savings opportunities that result from reduced energy consumption, furniture costs, office space rental and construction costs. For this purpose, seven *benchmark workstations* are identified that are commonly found in high-density offices. The *benchmark workstations* are then evaluated and compared to redesigned/modified workstations after the utilization of the much slimmer, but equivalent in size FPM unit, while maintaining key ergonomic standards. A complete financial analysis is performed and Return-On-Investment (ROI) spreadsheets are developed that show savings under different scenarios.

* Definitions for words in *italics* can be found in Appendix A.

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Research Team

Research Team - 2003 Study

In 2003, through a fund from IBM, Kingsland Scott Bauer Associates (KSBA), Pittsburgh, PA, updated the original FPM study of 1998. The revisions were completed by Liana Berberidou-Kallivoka, Ph.D., Director of Research at KSBA, with significant contributions from Roger L. Kingsland, AIA, Managing Partner of KSBA. The study was edited by Anne Davis, Marketing Director of KSBA.

Participating Firms

The original study was commissioned by IBM in 1998, and completed by KSBA with assistance from Flack + Kurtz Consulting Engineers, LLP, New York, N.Y. KSBA is an architectural, interior design, planning and project management firm that specializes in the design of high-density, information/technology-based office environments. Flack + Kurtz is a multinational building services engineering firm headquartered in New York, with offices in Washington, DC, San Francisco, Seattle, London and Hong Kong, and with affiliates in Berlin, and Sydney.

KSBA managed the study and completed the research relative to workstation size and construction cost savings. Flack + Kurtz Consulting Engineers were responsible for all energy analysis associated with the reduced energy consumption of FPMs.

Project Director

The research team was headed by Roger L. Kingsland, AIA, Managing Partner of KSBA. Mr. Kingsland is head of the Performance Design research effort at KSBA, which involves linking facility design decisions to increased profitability through research in four areas; reduced capital costs, reduced energy costs, reduced healthcare costs, and increased productivity. Mr. Kingsland has published articles in several professional magazines, journals, and newsletters including Teleprofessional, Open Lines, and the American Banker Management Strategies. He has written several issues of SCOpE, KSBA's newsletter and given numerous lectures and presenta-

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tions on Performance Design to the American Telemarketing Association, the World Conference on Incoming Call Center Management, the EIS Users Conference and The Wharton School of Business.

Project Associates

Mr. Kingsland was assisted by Gary P. Moshier, AIA, who completed ergonomic research and participated in the workstation design effort, and Liana Berberidou-Kallivoka, Ph.D., who refined the study. Mr. Moshier, an Associate at KSBA, has an extensive interior design background and has worked on several high-density, information/technology office projects for clients including AT&T, CNG and PNC Bank. Dr. Berberidou-Kallivoka is a registered architect with a wide spectrum of work. She has published articles on energy conservation strategies, environmental sustainability issues, building performance simulations and high-performance workplaces.

Additional KSBA Team Members

KSBA's team included Grant E. Scott, AIA, Principal at KSBA, who assisted in the development of alternative workstation designs; Patricia Canfield, who assisted in the workstation designs; Robert Le Bras who handled the graphic design; Mark Mechling who produced the 3-D modeling of the workstations; and Brian Greene, AIA, and Choli Lightfoot who assisted with drafting.

Flack + Kurtz Team

The Flack + Kurtz energy analysis was completed by Lenny Zimmermann, a Partner in the firm and a professional engineer, consulting mostly on commercial and institutional projects, both new construction and retrofit. Mr. Zimmermann is an electrical engineer who has background knowledge in the fields of mechanical engineering and telecommunications. He was assisted by Mark Powasnik, a Flack + Kurtz Associate and registered engineer. Mr. Powasnik is a mechanical engineer who specializes in the design of heating, ventilation and air conditioning systems for commercial projects.

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1. Executive Summary

1.1 Scope of Study

1.1.1 Scope of Update

The updated study reflects the significant price decrease of *Flat Panel Monitors* (FPMs) that reduced the cost premium to the equivalent *Cathode Ray Tube Monitors* (CRTs). The study also re-examines the earlier assumptions and associated costs to accurately reflect today's business practices. In particular, workstation furniture costs, construction costs and electricity rates were revised. In addition to the 15-inch FPM, this study makes the case for the 17-inch FPM and its equivalent CRT.

1.1.2 Advantages of Flat Panel Monitors

The original study was commissioned to determine the extent to which facility costs will be reduced through the use of FPMs in high-density, open plan office environments. The purchase or lease cost of these monitors is greater than the more common CRTs. However, the FPMs have three distinct advantages over the CRTs:

1. FPMs use considerably less space (2.5 inches deep versus 16 to 18 inches deep for the comparable CRTs) and, therefore, there is potential to realize savings in office rental and construction costs.
2. FPMs use less energy.
3. The graphic images produced by the FPMs are of higher quality and the monitors appear to be more tolerant to a variety of lighting conditions; therefore, there is potential for improved occupancy comfort and satisfaction, reduced healthcare costs and increased productivity.

1.1.3 Facility Related Savings Addressed Only

The study addresses only the quantitative, facility related issues which include potential savings in rent, furniture costs, construction costs and energy consumption. The more abstract, qualitative issues, relative to occupancy comfort, healthcare costs and productivity are beyond the scope of this study.

1. Executive Summary

1.2 Methodology / Assumptions

1.2.1 Benchmark Versus Modified Workstations

The methodology used involved, first, the identification of seven *benchmark workstations* typically found in high-density, open plan office environments (see Figure 1). Each workstation was then redesigned to determine any space savings associated with the use of FPMs, while maintaining other *benchmark workstation* features, such as *functional worksurface area* and *standing area* (see Figure 2). As part of the redesign process, ergonomic dimensional parameters, such as minimum toe/knee space requirements and optimum dimensions from the monitor screen to the user's eyes and the edge of the keyboard, were researched and documented.

1.2.2 Non-Functional Worksurface Eliminated

Most of the space savings are realized through elimination of worksurface area that is necessary primarily because of the depth of the CRT monitor. For example, a linear worksurface must be 3 feet deep to accommodate a CRT and only 2 feet deep to accommodate an FPM. Since normal human reach does not extend beyond 2 feet, the additional 1 foot of depth is required, primarily, for the excessive depth of the CRT monitor and has little additional functional use.

1.2.3 Rent Savings

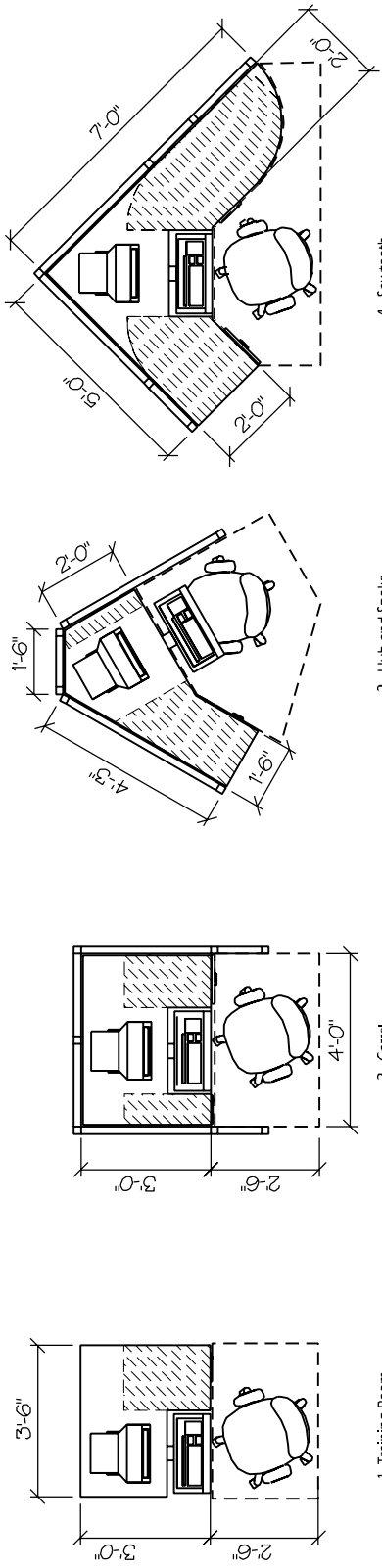
The smaller sizes of the FPM workstations will therefore, result in rent savings, which are estimated in the Financial Analysis, Section 8.

1.2.4 Energy Savings

FPMs use approximately 60% less energy than conventional CRTs. Energy savings were calculated four ways:

1. Reduced energy costs to power monitors.
2. Lower air conditioning energy costs resulting from reduced heat output from monitors.
3. Reduced first costs of power systems.

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1. Training Room

2. Carrel

3. Hub and Spoke

4. Sawtooth

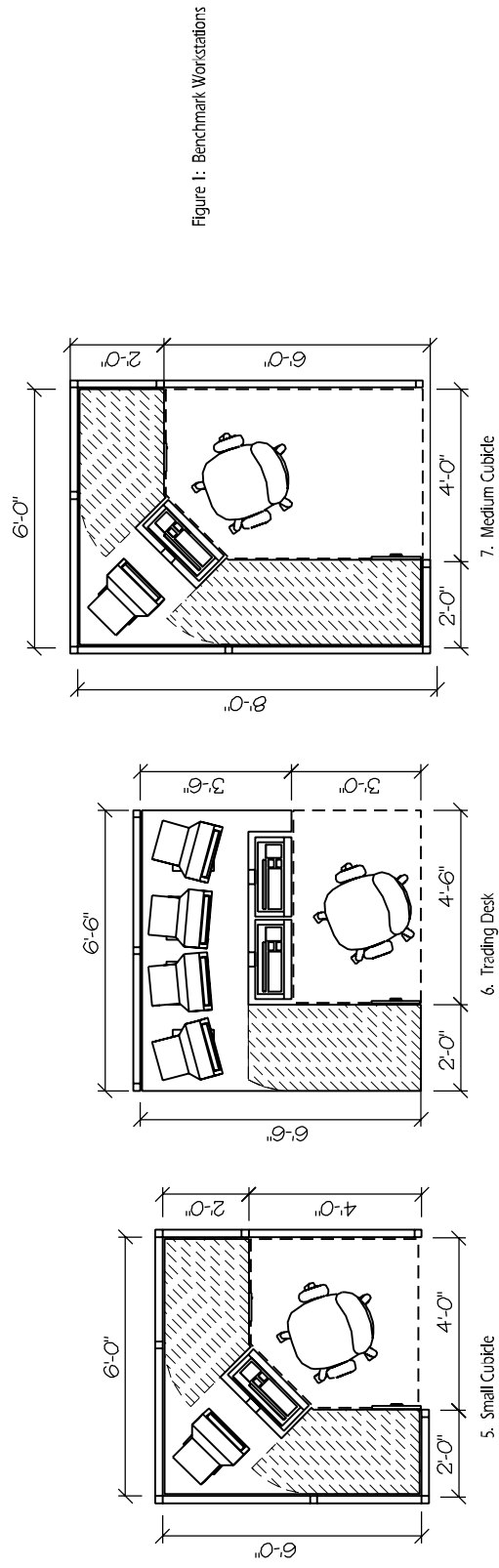
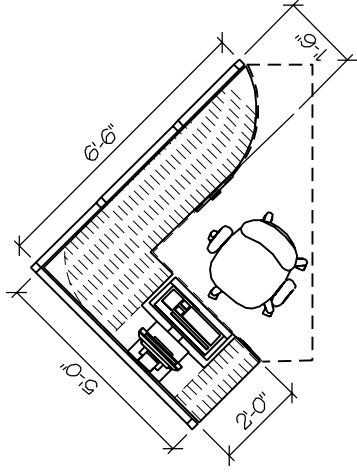
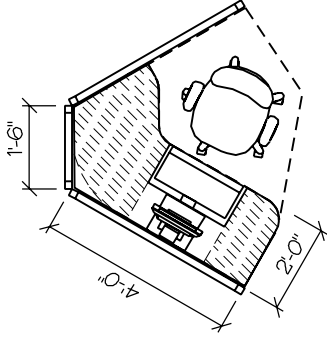


Figure 1: Benchmark Workstations

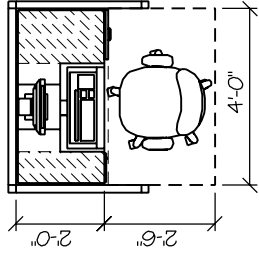
Analysis of Facility Cost Savings
Associated with Flat Panel Monitors



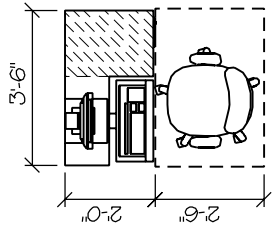
4. Sawtooth



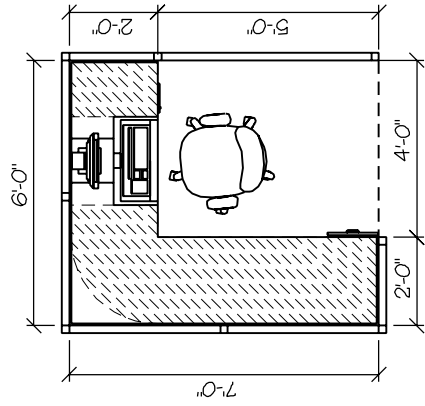
3. Hub and Spoke



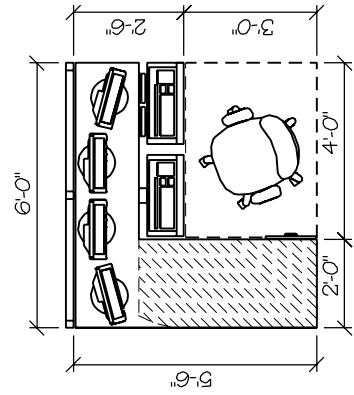
2. Carrel



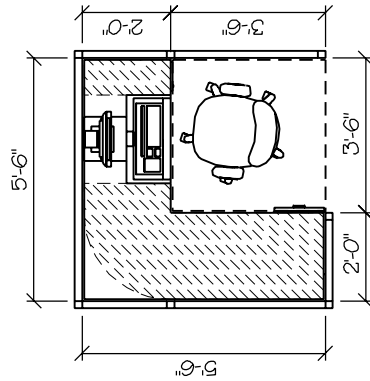
1. Training Room



7. Medium Cubicle



6. Trading Desk



5. Small Cubicle

Figure 2. Modified Workstations

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4. Reduced first costs of air conditioning systems.

1.2.5 Furniture Savings

Since the redesigned workstations are smaller and, in some cases, simpler furniture costs can be lower. The resulting savings were estimated based on input from several leading furniture manufacturers.

1.2.6 Construction Cost Savings in New Space

Additional savings in the form of reduced construction costs can be realized by purchasers of FPMs who relocate to new space. The savings in construction costs associated with reduced space requirements were calculated and included in the analysis.

1.2.7 All Costs Expressed Over Time

All facility costs are expressed in "cost over time" via rent or loan payments. Any capital costs that would not normally be included in *gross rent* were converted to cost over time by assuming a market loan rate of 8.5%. The loan term for furniture, and tenant fit-out construction, was assumed to be equal to the term of the lease or 5 years. The term for base building construction was assumed to be 20 years.

The loan term for the financing of the FPMs was assumed to be 5 years at a rate of 8.5%. The price difference between the FPMs and the equivalent CRTs was based on average monitor sale prices as of March 2003.

1.2.8 Savings Scenarios

The Return-On-Investment (ROI) and savings per workstation per year are calculated based on various rent assumptions in the Financial Analysis Section 8.

Three scenarios were assumed:

- **Scenario A** - A company would either move to new space, or reconfigure its existing space and realize savings associated with reduced rent, energy consumption and the cost to purchase

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smaller, simpler furniture.

- **Scenario B** - A company would move into new space and realize savings in tenant fit-out costs, in addition to those in Scenario A.
- **Scenario C** - A company would move into a new building, where savings associated with the reduced size of major mechanical and electrical equipment could be realized, in addition to savings mentioned in Scenarios A and B.

Since the savings in energy consumption alone do not justify the purchase cost of an FPM, each of these scenarios assumes additional savings. In all cases, it is assumed that the cost of new furniture is independently justified.

1.2.9 Base Building Savings

Due to the reduced energy requirements for FPMs, it is also possible that major mechanical and electrical building systems could be downsized, depending on the size of the new facility. This would occur if the mechanical and electrical systems of a new building were designed around the reduced energy requirements of an FPM. Although many information / technology-based office facilities are located in existing spaces, there are many advantages to designing new buildings specifically for these uses. By combining the savings associated with FPMs with other building technologies appropriate for information / technology facilities, the total energy consumption in a new building can be significantly reduced.

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1.2.10 Reduced Modifications to Existing Mechanical Systems

Most mechanical/electrical systems in older office buildings (and for that matter, many new office buildings) are not of adequate capacity to accommodate the higher density of people and computers found in information / technology office environments. Therefore, it is often necessary to make expensive modifications to these systems. Depending on specific project requirements and the scale of the project, the use of FPMs may result in sufficient reduction in energy requirements to avoid modifications to existing mechanical systems.

1.3 Findings

1.3.1 Range of Savings

Section 8 contains the Financial Analysis of the study. The *rentable square feet (RSF)* saved per workstation are derived from the Workstation Size Comparisons in Section 4.3. The savings per workstation per year, and the ROI for each of the scenarios are calculated for various assumed gross rental rates in the Financial Analysis, Section 8.

The breakeven point, where the ROI is positive, varies between rental rates as high as \$45 per RSF to less than \$5 per RSF per year depending on the type of workstation and Savings Scenario selected. In some cases, savings are realized even without any rent consideration.

Based on the ROI Analysis, there is a pattern indicating the larger the workstation, the greater the potential for savings. For example, using Scenario B at \$15 per square foot rental rate, the return on investment for each workstation is indicated below, when 15-inch FPMs are utilized. The workstation types have been prioritized based on an increasing weighted scale of the workstation's area and the area savings

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needed to power the monitor, increase in proportion to the size of the workstation.

1.3.3 The Trading Desk Case

All workstations except type 6 (trading desk) employ a single monitor. The trading desk is the only station with multiple monitors, and this is the reason it does not follow the expected savings pattern. Since the size of the workstation is relatively small, any space savings must offset the cost of four monitors rather than just one. Therefore, this workstation offers the least opportunity for savings. However, Trading Rooms are often located in areas, such as Wall Street, where rental rates are high enough to justify the use of FPMs. Moreover, if expansion space is not available at any cost, workstation density can still be increased by approximately 20% with the use of FPMs.

1.3.4 Facility Changes are Necessary to Realize Full Range of Savings

The data demonstrate that the use of the FPMs is financially justified when combined with substantial facility changes. This is because the savings in energy alone do not offset the additional cost of the FPM. In order to realize the full range of savings associated with higher density and reduced furniture costs, the tenant must be committed to purchasing new furniture and either reconfiguring existing space or moving into new space. Therefore, the best opportunities for using FPMs are in situations where the purchase of new furniture has been justified independently. These situations may include:

- A need to improve operations and staff efficiency that cannot be supported with existing furniture.
- Existing furniture is beyond its useful life.
- Consolidation of several locations having different types of furniture into a single location.
- Start-up of a new business unit or expansion of an existing business unit in a new location.

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2. Hypothesis

2.1 Facility Savings

The trend in office design is toward higher density, open plan work spaces, with computers at most workstations. Computer equipment, particularly CRT monitors, occupies valuable floor area that decreases the efficiency of open office space. FPMs have a fraction of the depth of CRT's and offer potential to save space. In addition, CRT's consume more power than FPMs, which results in increased operating costs and increased capital costs for larger air conditioning and electrical systems. Therefore, although on a component basis FPMs are more expensive, there is potential for facility savings to offset and exceed the additional cost.

2.2 Potential for Additional Savings

There are also qualitative savings opportunities with the use of FPMs. LCD technology eliminates flicker or movement of the pixels that is typical with CRTs. Moreover, due to the flat surface and matte finish of the screen, the FPM appears to be more tolerant to a wide variety of daylighting and electrical lighting conditions found in office environments. As a consequence, there appear to be substantial opportunities to improve occupancy comfort, reduce healthcare costs and increase productivity through reduced operator eyestrain.

It could be, therefore, demonstrated that the decision to use FPMs can be justified financially, when analyzed holistically and all potential savings are included in the analysis. The purchaser of FPMs can empirically justify the purchase, and enjoy not only substantial facility savings, but realize the even greater benefits of improved employee health, satisfaction and productivity as well.

3. Methodology

3.1 Facility Savings

This study focuses solely on savings associated with office facilities that employ FPMs. These savings include:

- A. Savings associated with reduced workstation area:
 - reduced rent
 - reduced furniture costs
 - reduced construction costs for desirable components not normally included in rent

- B. Savings associated with reduced energy consumption:
 - lower utility bills
 - reduced construction costs resulting from lower air conditioning and electrical equipment capacity

3.2 Benchmark Workstations

The methodology employed to analyze the potential facility operating savings involved first the identification of *benchmark workstations*, typically found in high density, open office environments that employ CRT monitors. Based on the researchers experience and knowledge of market product offerings from a variety of furniture manufacturers, seven workstations were selected that reflect a wide range of uses and densities. A conscious effort was made for the *benchmark workstations* to consistently reflect proper ergonomic dimensional standards.

Ergonomic standards were established based on research that considered dimensional extremes from a Fifth Percentile Woman up to a Ninety-fifth Percentile Man for the following horizontal dimensions:

- a. Face of the monitor to the human eye.
- b. Face of the monitor to the front edge of

3. Methodology

keyboard tray worksurface.

- c. Front edge of keyboard tray worksurface to back of chair in a normal seating position and in a reclined position.
- d. Front edge of keyboard to front of user's shoes (leg room).
- e. Width of circulation corridors.

3.3 Modified Workstations

The seven *benchmark workstations* were then redesigned to accommodate FPMs (*modified workstations*), while maintaining other features of the workstation constant. The goal was to realize space savings by eliminating worksurface area that was required primarily because of the larger size of the CRT monitor, and which did not otherwise contribute to the functionality of the workstation.

3.4 Workstations Designed to Reflect Best Practices

The workstations were appropriately modified to reflect best practices and eliminate differences between the benchmark and *modified workstations* that are not attributable to the reduced size of the FPM. For example, it is common for keyboards to be mounted on trays which extend out from the front edge of the worksurface. This is particularly true in workstations, where the keyboard and monitor are in the corner. This type of cantilevered tray would position the user further back from the worksurfaces on either side of the keyboard; therefore, reducing the amount of worksurface accessible to the user. Except in cases, where the design of the workstation requires a cantilevered keyboard tray, all keyboard trays are flush with the front edge of the worksurface.

3.5 Functional Worksurface Area

A distinction is made between total worksurface area and *functional worksurface area*, which is defined as the area of worksurface equal to, or greater than 12 inches

3. Methodology

from the front edge and less than or equal to 24 inches from the front edge. This eliminates two types of worksurface areas from the “functional” category. First, any worksurface that is less than 12 inches deep, and second, any area that extends beyond 24 inches from the front edge, because this space is not within easy reach of the user and, therefore, is probably only functional for items that are unnecessary, or should be stored elsewhere.

The redesign also attempted to keep the *standing area* similar in both situations. However, it was determined that comparable worksurface area was the primary consideration and reductions in standing area were acceptable, as long as they did not fall below functional minimums for seating and circulation.

3.6 Construction Cost

The amount of space saved is determined by comparing the *benchmark workstations* with the workstations redesigned for FPMs. Additional savings from smaller size workstations can be realized through reduced construction costs. Some construction costs are density-dependent (vary according to the number of people who work in a space). These might include:

- Computers, computer power, and data cabling.
- Air conditioning system costs associated with heat generated from people.
- Welfare support spaces, such as restrooms, breakrooms and cafeterias.

In many cases, purchasers of FPMs will relocate to new space. The construction cost savings associated with reduced space requirements, but not normally amortized in the rent, are calculated separately and included in the study.

3. Methodology

3.7 Energy Savings

The methodology used to calculate energy savings from the reduced power requirements for FPMs involves measuring power consumption and comparing cost differences based on various assumptions. Actual power consumption differs from the manufacturer's specifications due to varying loading conditions. When monitors are not in continuous use, they enter an energy conservation "sleep" mode. Power consumption was calculated in actual field conditions using an ammeter which records threshold maximum and minimum "steady-state" current flow over time. This ammeter was connected to the AC line leading to the monitor or FPM power supply. Power calculations were then produced based on 120 volts AC and 0.9 power factor for both displays.

The savings in air conditioning operating costs were also considered, based on calculating the reduced heat gain (from reduced power consumption). Air conditioning costs include the cumulative effects of room latent heat, outside air sensible heat, outside air latent heat, supply air fan power, fan heat, chillers, chilled water and condenser water pumping, and cooling towers. It is assumed that BTU meters are used to monitor and bill individual tenants for chilled water usage.

4. Workstation Analysis

4.1 Assumptions

4.1.1 Workstation Types

Seven workstation designs were identified, typical to a variety of high-density, open plan, office environments. The workstation types are prioritized based on an increasingly weighted scale of the workstation's area, and the area savings realized when comparing the benchmark and the modified designs.

- Type 1: Training** - Small workstations arranged in rows and oriented towards a trainer's desk with minimal room for keyboard, monitor and single writing surface.
- Type 2: Carrel** - Small workstation with panels on three sides similar to a study carrel at a library. Includes space for monitor, keyboard, two-drawer file cabinet and minimal writing/reading surface.
- Type 3: Hub and Spoke** - V-shaped workstation arranged in a six-unit "daisywheel" configuration.
- Type 4: Sawtooth** - L-shaped workstation arranged in serpentine configuration with space for keyboard, monitor, two file drawers and two reading/writing worksurfaces.
- Type 5: Small Cubicle** - Six-foot square enclosed cubicle with space for two reading/writing worksurfaces and two sets of file cabinets arranged in a rectilinear fashion.
- Type 6: Trading Desk** - Small worksurface with multiple screens for use by traders (stocks, bonds, commodities, etc.).
- Type 7: Medium Cubicle** - Six feet by eight feet enclosed cubicle similar to the Small Cubicle, only larger.

4. Workstation Analysis

4.1.2 Workstation Furniture

The *benchmark workstations* selected are “generic”; typical configurations that are available from a variety of furniture manufacturers. The *modified workstations* also use components readily available and regularly provided by furniture manufacturers.

4.1.3 Overhead Storage

Depending on the workstation panel height, many of the workstations selected can employ overhead storage units, which are not shown because they are not germane to this study.

4.1.4 Keyboards

It is common in many workstation design solutions to provide a freestanding keyboard tray that cantilevers beyond the edge of the worksurface. For the purposes of this study, keyboard trays flush with the front end of the counter were included in both the *benchmark workstations* and the *modified workstations* because this configuration allows for:

- more effective use of the worksurface immediately adjacent to each side of the keyboard,
- consistency across both groups of solutions and accents only the differences relative to monitor size.

4.1.5 Circulation

In order to determine total space savings, it is necessary to include circulation in the area calculations. It was assumed that a 3-foot minimum *local circulation* corridor would serve individual workstations, and half of a *central circulation* corridor would serve each workstation cluster (with the other half serving the adjacent cluster). The width of the central corridor is based on the nature and configuration of the workstation clusters. Since many building codes limit dead-end corridors to 20 feet, workstation clusters are 20 feet deep or less.

4.1.6 Standing Area

Workstations that are not enclosed cubicles share *standing area* with *local circulation*. In this case, it is assumed

4. Workstation Analysis

that the *local circulation* is 3 feet wide and any remaining space will be part of the *standing area*. The minimum standing area is 2 feet - 6 inches back from the edge of the worksurface. This allows adequate space for the user to lean back in his or her chair without encroaching on the circulation space. It is also assumed that the additional space necessary to push back a chair when the user stands up can come from a portion of the *local circulation*.

4.1.7 Functional Worksurface Area

A substantial portion of the worksurface in the *benchmark workstation* designs is necessary, primarily, because of the depth of the monitor. The *functional worksurface area* distinguishes between worksurface area necessary for large monitor applications and worksurface area that has other functional validity. The *functional worksurface area*, as it has been defined for the scope of this study, eliminates any odd-shaped corners and space that is either too shallow for practical work/storage, or too deep and difficult to reach. The area of keyboard, keyboard tray and the worksurface behind the keyboard tray (under the monitor) were not included in the worksurface area calculations.

4.1.8 17-Inch and 19-Inch CRT Monitors

The trend in today's business offices is toward more information being displayed on the monitor, particularly in information-based businesses such as claims processing and customer service. Therefore, this study assumes the use of either 17-inch or 19-inch CRT monitors and the equivalent FPMs.

4.1.9 Equivalent FPM

IBM, as well as other computer manufacturers, produce 15-inch FPMs, which are equivalent to the 17-inch CRTs, which actually measure only 16 inches diagonally. The 15-inch FPM is equivalent to the larger CRT, since the image extends over the entire width and height of the FPM whereas, on a CRT there is a frame of "dead space"

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on all sides between the edge of the image and the edge of the screen. Also, the resolution of the 15-inch FPM is 1024 x 768 pixels, identical to the 17-inch CRT. Similar arguments prove the 17-inch FPM equivalent to the 19-inch CRT.

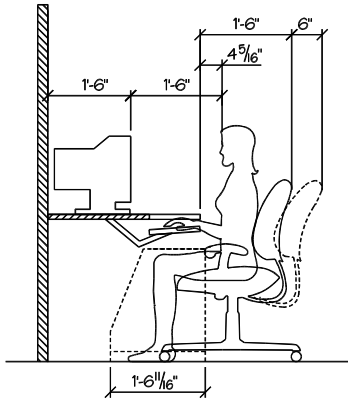
4.1.10 Monitor Cost Comparisons

According to KSBA's cost comparison survey, the average cost for a 15-inch FPM is \$395, while the average cost for a comparable 17-inch CRT is \$200 (as of March 2003). The average cost for a 17-inch FPM is \$575, while the average cost for a comparable 19-inch CRT is \$295 (as of March 2003). For the purposes of this study, it is assumed that the price difference of \$195 and \$280 respectively is financed with a 5-year loan at an interest rate of 8.5%. The extra cost per year and per workstation is indicated in the Financial Analysis, Section 8. Actual monitor prices may vary depending on the number of units ordered, delivery schedule, and/or corporate discounts.

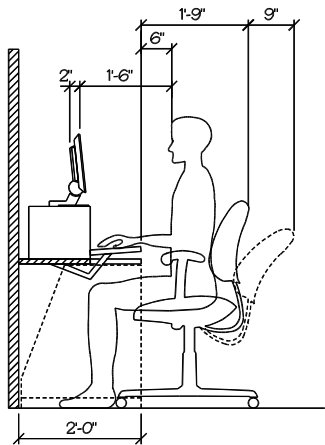
Finally, it should be mentioned, that as with any relatively new technology, LCD flat panel technology is currently more expensive primarily because has not yet reached the same efficiency of production as the CRT monitors. However, as it has been evidenced during the last few years, FPM prices have decreased considerably and this trend is expected to continue.

4. Workstation Analysis

4.2 Ergonomic Parameters



**Fifth Percentile Female
(with CRT)**



**Ninety-fifth Percentile Male
(with FPM)**

The adjacent diagrams show the results of ergonomic research incorporated into the study. The diagrams show the extremes defined by a Fifth Percentile Female and a Ninety-fifth Percentile Male. The Fifth Percentile Female diagram demonstrates the need for a 3-foot deep work-surface (from back panel to front edge of worksurface or keyboard tray) when CRT monitors are used. The Ninety-fifth Percentile Male demonstrates that the controlling dimension for the depth of the worksurface with an FPM is not the monitor, but leg room requirements.

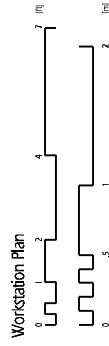
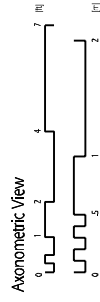
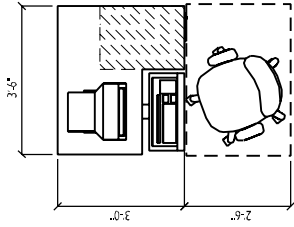
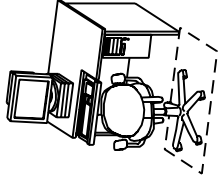
A depth of 2 feet - 6 inches was used as a minimum from the front edge of the worksurface to the back edge of the chair (when reclined).

Analysis of Facility Cost Savings
Associated with Flat Panel Monitors

4.3 Workstation Comparisons

Workstation Type 1 - Training Room

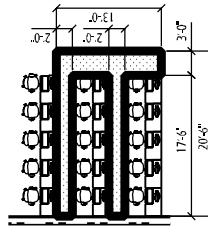
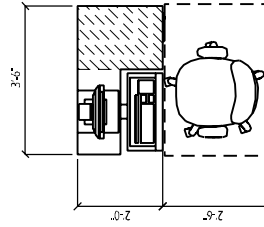
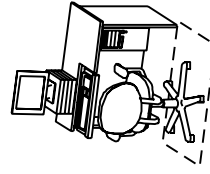
Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	30.75	2.86
Total Area (incl. circulation)	19.25	1.79
Footprint Area	8.75	0.81
Standing Area	3.00	0.28
Practical Worksurface Area		



Benchmark (CRT)



Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	26.65	2.48
Total Area (incl. circulation)	15.75	1.46
Footprint Area	8.75	0.81
Standing Area	3.00	0.28
Practical Worksurface Area		



Modified (FPM)

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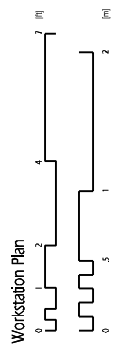
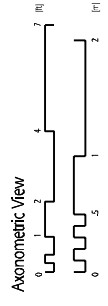
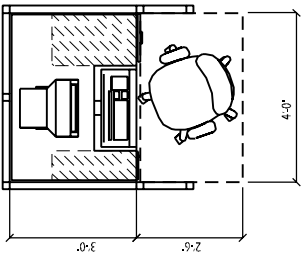
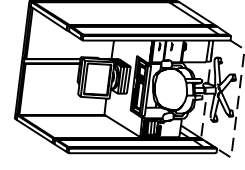
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Associated with Flat Panel Monitors

4.3 Workstation Comparisons

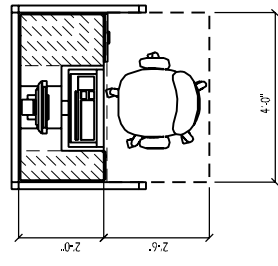
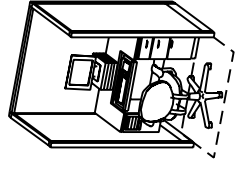
Workstation Type 2 - Carrel

Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	33.29	3.09
Total Area (incl. circulation)	22.00	2.04
Footprint Area	10.00	0.93
Standing Area	3.75	0.35
Practical Worksurface Area		

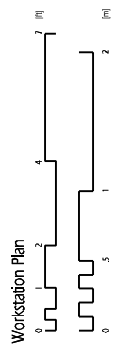


Benchmark (CRT)

Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	28.59	2.66
Total Area (incl. circulation)	18.00	1.67
Footprint Area	10.00	0.93
Standing Area	3.51	0.33
Practical Worksurface Area		



Modified (FPM)



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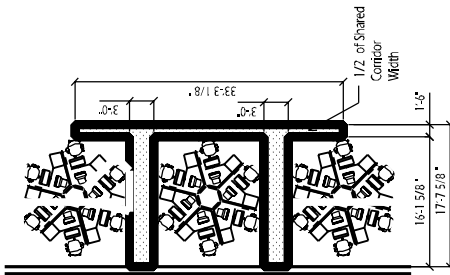


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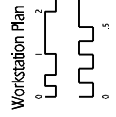
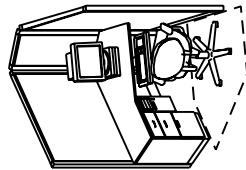
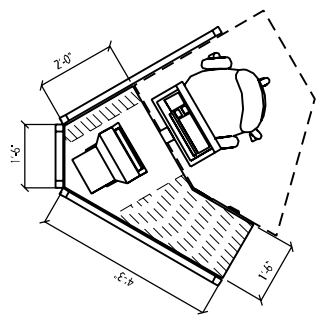
Analysis of Facility Cost Savings
Associated with Flat Panel Monitors

4.3 Workstation Comparisons
Workstation Type 3 - Hub and Spoke

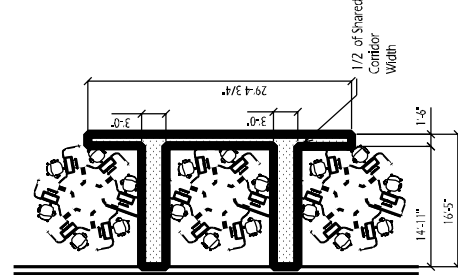
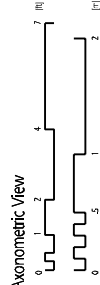
Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	48.88	4.54
Total Area (incl. circulation)	24.3	2.26
Footprint Area	13.59	1.26
Standing Area	4.58	0.43
Practical Worksurface Area		



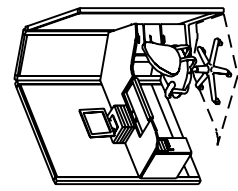
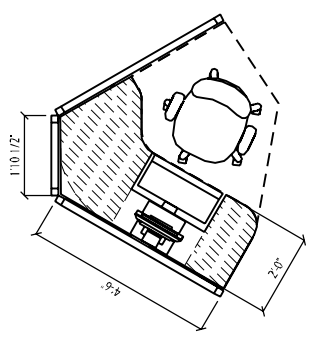
Benchmark (CRT)



Axonometric View



Modified (FPM)



Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	44.79	4.16
Total Area (incl. circulation)	20.95	1.95
Footprint Area	9.57	0.89
Practical Worksurface Area	6.85	0.64

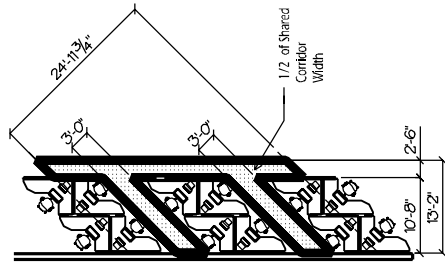
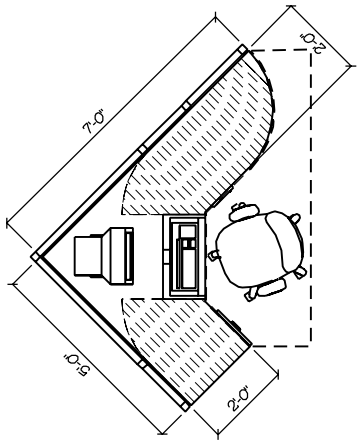
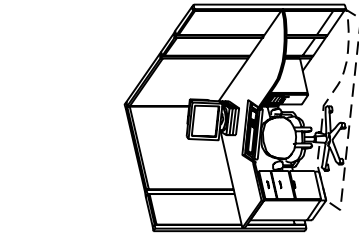


Analysis of Facility Cost Savings
Associated with Flat Panel Monitors

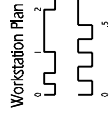
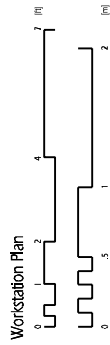
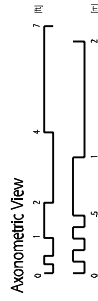
4.3 Workstation Comparisons

Workstation Type 4 - Sawtooth

Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	58.09	5.40
Total Area (incl. circulation)	34.26	3.18
Footprint Area	13.08	1.22
Standing Area	12.69	1.17
Functional Worksurface Area		

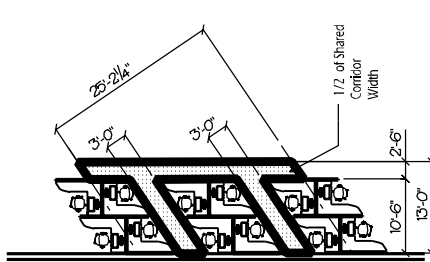
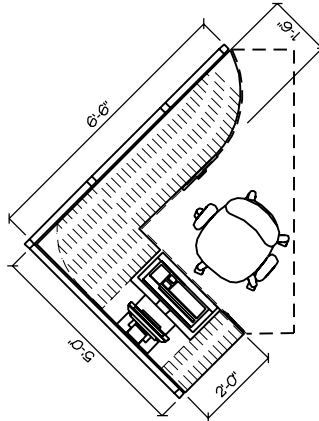
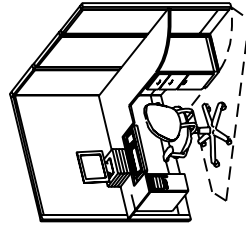


Benchmark (CRT)



Modified (FPM)

Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	52.63	4.89
Total Area (incl. circulation)	29.93	2.78
Footprint Area	14.34	1.33
Standing Area	11.80	1.10
Functional Worksurface Area		



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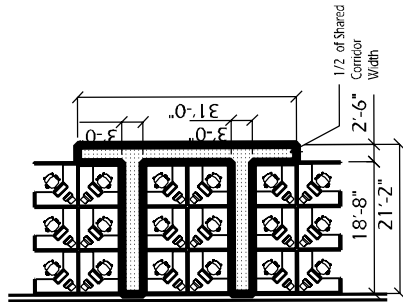
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Associated with Flat Panel Monitors

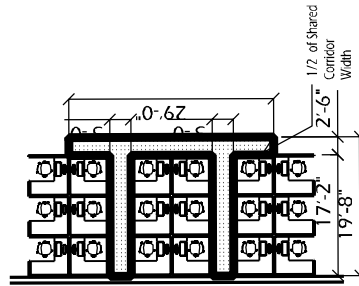
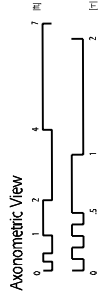
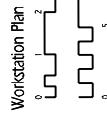
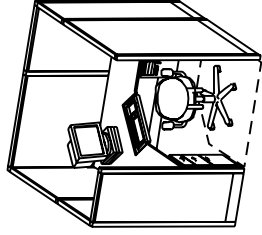
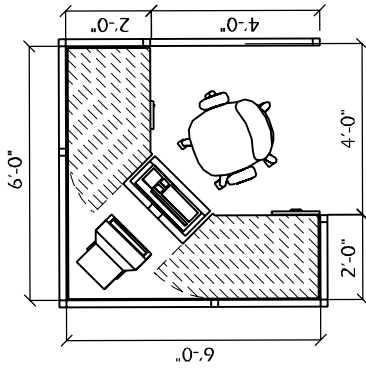
4.3 Workstation Comparisons

Workstation Type 5 - Small Cubicle

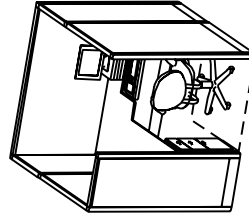
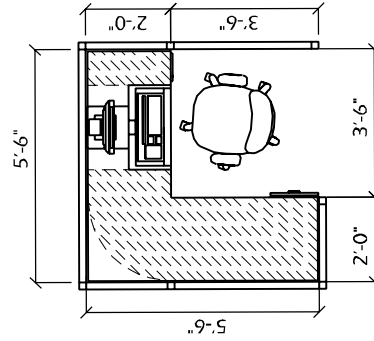
Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	54.68	5.08
Total Area (incl. circulation)	36.00	3.34
Footprint Area	14.78	1.37
Functional Worksurface Area	12.88	1.19



Benchmark (CRT)

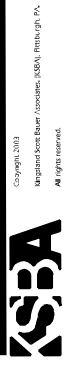


Modified (FPM)



Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	47.53	4.41
Total Area (incl. circulation)	30.25	2.81
Footprint Area	12.25	1.13
Functional Worksurface Area	12.64	1.17

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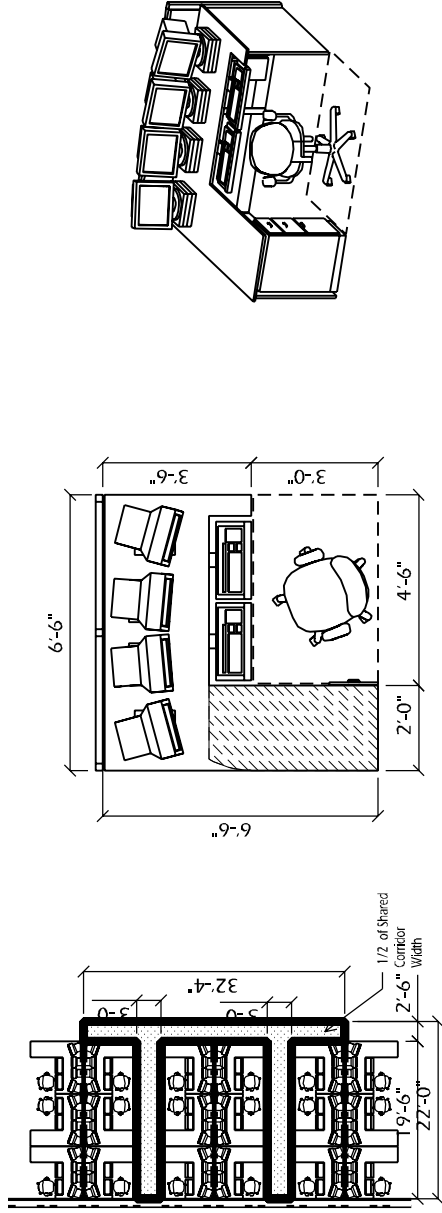


Analysis of Facility Cost Savings
Associated with Flat Panel Monitors

4.3 Workstation Comparisons

Workstation Type 6 - Trading Desk

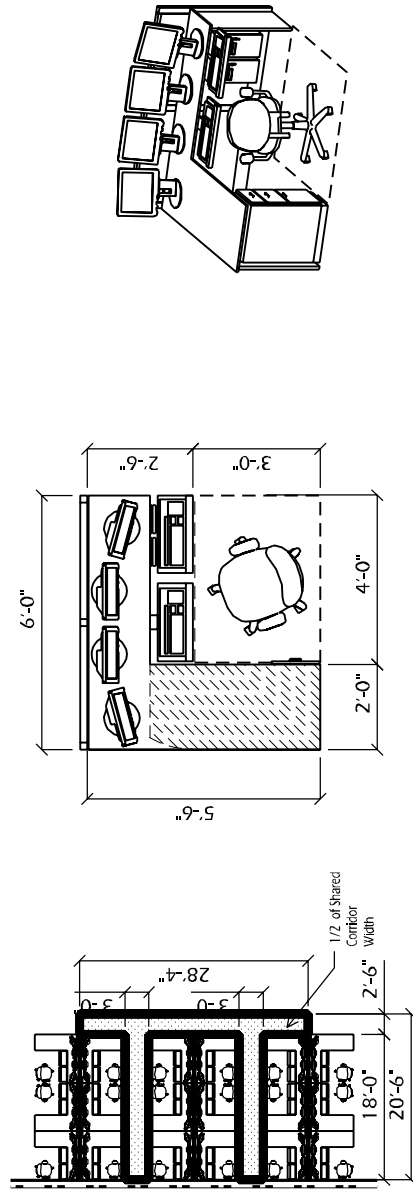
Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	59.28	5.51
Total Area (incl. circulation)	42.25	3.93
Footprint Area	13.5	1.25
Standing Area	7.92	0.74
Practical Worksurface Area		



Benchmark (CRT)



Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	48.40	4.49
Total Area (incl. circulation)	33.00	3.07
Footprint Area	12.00	1.11
Standing Area	7.92	0.74
Practical Worksurface Area		



Modified (FPM)

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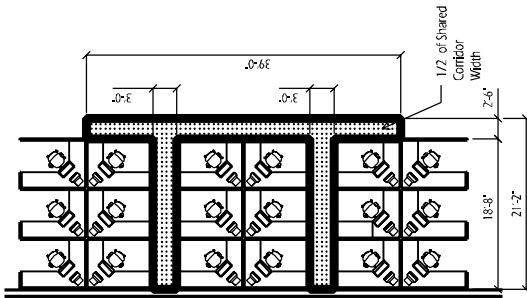
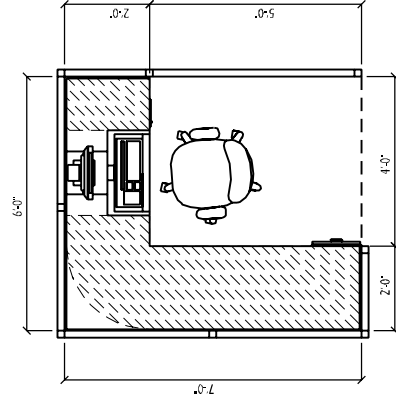
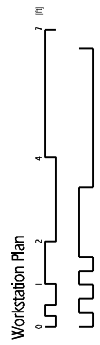
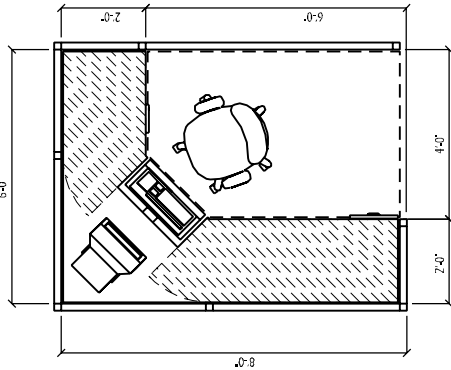
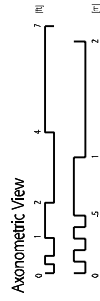
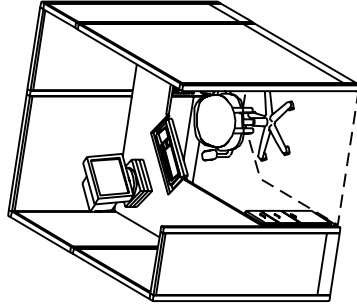
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Analysis of Facility Cost Savings
Associated with Flat Panel Monitors

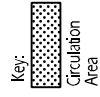
4.3 Workstation Comparisons
Workstation Type 7 - Medium Cubicle

Benchmark (CRT)	Sq. Ft.	Sq. Meters
Area per Workstation	68.79	6.39
Total Area (incl. circulation)	48.00	4.46
Footprint Area	22.30	2.07
Standing Area	16.79	1.56
Functional Worksurface Area		



Benchmark (CRT)

Modified (FPM)



Modified (FPM)	Sq. Ft.	Sq. Meters
Area per Workstation	61.74	5.74
Total Area (incl. circulation)	42.00	3.90
Footprint Area	20.00	1.86
Functional Worksurface Area	16.56	1.54

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5. Energy Analysis

5.1 Assumptions

5.1.1 CRT Energy Consumption

Using an ammeter which records threshold maximum and minimum "steady-state" current flow over time, the standard CRT exhibited a maximum of 1.0 amperes and a minimum of 0.7 amperes. This current was measured at the AC line leading to its power supply. For the sake of simplicity, it is assumed that this monitor draws an average current of 0.85 amperes over its long-term operating time period. Assuming that the unit has a 0.9 power factor and is operating at 120 volts, the average load is 92 watts.

5.1.2 FPM Energy Consumption

Using an ammeter which records threshold maximum and minimum "steady-state" current flow over time, the FPM exhibited a maximum of 0.5 amperes and a minimum of 0.2 amperes. This current was measured at the AC line leading to its power supply. For the sake of simplicity, it is assumed that this monitor draws an average current of 0.35 amperes over its long-term operating time period. Assuming that the unit has a 0.9 power factor and is operating at 120 volts, the average load is 38 watts.

5.1.3 Time in Use

Operating energy costs are based on 24 hours per day, seven days per week operation. It is assumed that the facility is fully occupied for 8 of these hours each day and 1/3 occupied for the remainder 16 hours of any given day.

5.1.4 Cost of Electricity

Electric utility power costs were assumed to be at the average national rate of 7.36 cents per kilowatt hour (source: Department of Energy, Energy Information Administration, Report Released: January 2002).

5.1.5 Included Costs

Annual energy costs are based on the electricity costs required to power the number of monitors being ana-

5. Energy Analysis

lyzed per workstation and the air conditioning costs to cool the monitors.

Air conditioning costs also include the cumulative effects of room latent heat, outside air sensible heat, outside air latent heat, supply air fan power, fan heat, chillers, chilled water and condenser water pumping, and cooling towers. It is assumed that BTU meters are used to monitor and bill individual tenants for chilled water usage.

Construction costs are based on the effects of the "fit-out" costs to provide branch circuitry to workstations and for ductwork runouts. It is assumed that the design of these branch circuitry provisions and ductwork will be able to vary based on the monitor loading in the workstation. Also factored in is the cost based on the overall workstation area.

**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

5. Energy Analysis

5.2 Energy Savings

	Area / Workstation (usable s.f.)	Electrical Load / Workstation [W]	Annual Energy Cost / Workstation	Construction Cost / Workstation	Annual Energy Savings / Workstation	Annual Energy Savings / Usable s.f.	Annual Energy Savings / Rentable s.f.	Reduced Construction Cost / Workstation
1: Training Room								
Benchmark	30.75	92	\$59.19	\$461.25				
Modified	26.65	38	\$33.94	\$165.11	\$25.25	\$0.95	\$1.09	\$296.14
2: Carrel								
Benchmark	33.29	92	\$59.19	\$499.35				
Modified	28.59	38	\$33.94	\$177.13	\$25.25	\$0.88	\$1.02	\$322.22
3: Hub and Spoke								
Benchmark	48.88	92	\$59.19	\$733.20				
Modified	44.79	38	\$33.94	\$277.50	\$25.25	\$0.56	\$0.65	\$455.70
4: Sawtooth								
Benchmark	58.09	92	\$59.19	\$871.35				
Modified	52.63	38	\$33.94	\$326.08	\$25.25	\$0.48	\$0.55	\$545.27
5: Small Cubicle								
Benchmark	54.68	92	\$59.19	\$820.20				
Modified	47.53	38	\$33.94	\$294.48	\$25.25	\$0.53	\$0.61	\$525.72
6: Trading Desk								
Benchmark	59.28	368	\$236.77	\$889.20				
Modified	48.40	152	\$135.74	\$299.87	\$101.03	\$2.09	\$2.40	\$589.33
7: Medium Cubicle								
Benchmark	68.79	92	\$59.19	\$1,031.85				
Modified	61.74	38	\$33.94	\$382.52	\$25.25	\$0.41	\$0.47	\$649.33

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6. Furniture Cost Analysis

6.1 Manufacturers Contacted

To determine savings associated with the reduced workstation sizes (*benchmark vs modified*), copies of the workstation comparison drawings were sent to and cost estimates requested from the following major furniture manufacturers: Steelcase, SMED International, Teknion, Allsteel, Interior Concepts, Herman Miller, Haworth and The Knoll Group.

6.2 Assumptions

6.2.1 Keyboard Trays

Each company was asked to estimate the cost difference between the *benchmark* and *modified workstations* for the worksurfaces and furniture panels. The design configurations incorporate a keyboard tray integral to the worksurface, in lieu of one that is freestanding, since it provides the most efficient access to the adjacent surfaces. The manufacturers, who indicated there is a premium cost associated with this solution, were asked to assume the more typical extended keyboard tray when developing the cost estimates.

6.2.2 Worksurface

Some manufacturers indicated that a two-foot deep worksurface, which is typically the size used in the *modified workstations*, is not a stock size that they manufacture. Under this circumstance, the worksurface and panel costs were not used.

6.2.3 Furniture Savings

The furniture savings noted on the Financial Analysis spreadsheets indicate the average savings based on the cost estimates provided for each workstation by the manufacturers. They are also based on savings with average corporate discounts assuming an order of 100 workstations. Actual savings may vary according to specific project circumstances.

7. Construction Cost Analysis

7.1 Assumptions

7.1.1 Relocated Office Space

In order to realize the full potential of offsetting savings, purchasers of FPMs need to replace the workstation furniture. Often furniture replacement is most feasible when the office space is moved to a new location. This solution allows construction and furniture installation to be completed in one space, while business operations continue uninterrupted in the original space.

7.1.2 Construction Costs In Addition to Rent

The cost of construction includes two components; the base building (building structure, skin and primary mechanical/electrical systems) and tenant fit-out, which includes the cost of finishes in the office space. Many lease payments include amortization of capital costs for base building and tenant fit-out construction in the rent. However, high-density, information/technology-based offices can benefit from additional tenant fit-out components that can be economically justified, but are not included in the scope of tenant fit-out construction work normally provided by building owners as part of the rent. They are:

- High-performance acoustical ceilings
- Indirect lighting (vs direct parabolic lighting)
- Static control carpet tile (vs broadloom)
- Raised floor (computer floor) and modular power, communications and data cabling

When a business relocates, these costs will be incurred regardless of whether it employs FPMs or CRTs. Since employing FPMs will result in reduced space requirements, the cost savings of these improvements were also incorporated into the analysis.

7. Construction Cost Analysis

7.2 Construction Costs

Component	Additional Cost (\$ / Sq Ft)
High Performance Acoustical Ceiling	\$1.25
Pendant Mounted Indirect Lighting (vs ceiling-mounted direct)	\$0.50
Sound Masking (white noise)	\$0.95
Static Control Carpet Tile (vs broadloom)	\$1.10
Access Floor (vs concrete slab)	\$7.25
Modular Power, Data & Communications Cabling (vs "poke-thru")	-\$2.25
Total Construction Cost	\$8.80
Cost Amortization	
Amount	\$8.80
Rate	8.50%
Term (Years)	5
Cost Per Year	\$2.23

8. Financial Analysis

8.1 Return On Investment Analysis

This section presents the Return On Investment (ROI) results for the seven workstation types for various rental rates (ranging from \$6 to \$45 per square foot) under Scenarios A, B and C. In order to better understand the impact of the FPM price decrease on the ROIs, this section compares the 2003 results to the 1998 study results for the 15-inch FPM.

Appendix B-Financial Results presents in greater detail for each workstation type the savings per workstation per year, as well as the ROI results for various rental rates under the three Scenarios A, B and C. Appendix B includes the savings results and ROI analysis for both the 15-inch FPM and the 17-inch FPM.

**Analysis of Facility Cost Savings
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8. Financial Analysis

8.2 Workstation Type 1 - Training Room

Workstation Areas	USF	RSF	RSF Saved		Assumptions
			/ Wrkstn		
Benchmark Workstation	30.75	35.36			USF to RSF Markup 1.15
Modified Workstation	26.65	30.65	4.72		Interest Rate 8.50%
		1998	2003		Flat Panel Monitor Term (Yrs) 5
		Cost	Cost		Furniture Term (Yrs) 5
		/Year	/Year		Tenant Constr Term (Yrs) 5
15-inch Flat Panel Monitor (Per Workstation)		\$160.00	\$49.48		Base Bldg Constr Term (Yrs) 20
		1998	2003		Add'l Tenant Fit-Out Cost
		Savings	Savings		1998 2003
		/Year	/Year		\$9.07 \$8.80
Savings (per workstation)					
Electrical Energy		\$26.74	\$25.25		
Furniture		\$34.77	\$13.96		
Tenant Fit-Out		\$10.85	\$10.53		
Base Building Mech/Elect		\$31.29	\$31.29		

Return on Investment Analysis

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/		Assumed Gross Rent (RSF)
	1998 Return on Investment	2003 Return on Investment	1998 Return on Investment	2003 Return on Investment	1998 Return on Investment	2003 Return on Investment	
\$6.00	-43.9%	36.4%	-37.1%	57.7%	-17.5%	120.9%	\$6.00
\$9.00	-35.0%	65.0%	-28.3%	86.3%	-8.7%	149.5%	\$9.00
\$12.00	-26.2%	93.6%	-19.4%	114.8%	0.1%	178.1%	\$12.00
\$15.00	-17.4%	122.2%	-10.6%	143.4%	9.0%	206.7%	\$15.00
\$18.00	-8.5%	150.7%	-1.7%	172.0%	17.8%	235.3%	\$18.00
\$21.00	0.3%	179.3%	7.1%	200.6%	26.7%	263.8%	\$21.00
\$24.00	9.2%	207.9%	15.9%	229.2%	35.5%	292.4%	\$24.00
\$27.00	18.0%	236.5%	24.8%	257.8%	44.3%	321.0%	\$27.00
\$30.00	26.8%	265.1%	33.6%	286.4%	53.2%	349.6%	\$30.00
\$33.00	35.7%	293.7%	42.5%	314.9%	62.0%	378.2%	\$33.00
\$36.00	44.5%	322.2%	51.3%	343.5%	70.9%	406.8%	\$36.00
\$39.00	53.4%	350.8%	60.2%	372.1%	79.7%	435.4%	\$39.00
\$42.00	62.2%	379.4%	69.0%	400.7%	88.6%	463.9%	\$42.00
\$45.00	71.1%	408.0%	77.8%	429.3%	97.4%	492.5%	\$45.00

Table 8.2 compares for workstation Type 1 - Training Room with a 15-inch FPM the 1998 and 2003 ROI results for various rental rates, under Scenarios A, B, and C.

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8. Financial Analysis

8.3 Workstation Type 2 - Carrel

Workstation Areas	USF	RSF	RSF Saved		Assumptions
			/ Wrkstn		
Benchmark Workstation	33.29	38.28			USF to RSF Markup 1.15
Modified Workstation	28.59	32.88	5.41		Interest Rate 8.50%
			1998	2003	Flat Panel Monitor Term (Yrs) 5
			Cost	Cost	Furniture Term (Yrs) 5
			/Year	/Year	Tenant Constr Term (Yrs) 5
15-inch Flat Panel Monitor (Per Workstation)		\$160.00	\$49.48		Base Bldg Constr Term (Yrs) 20
			1998	2003	Add'l Tenant Fit-Out Cost
			Savings	Savings	1998
			/Year	/Year	2003
					\$9.07
					\$8.80
Savings (per workstation)					
Electrical Energy		\$26.74	\$25.25		
Furniture		\$42.63	\$46.95		
Tenant Fit-Out		\$12.44	\$12.07		
Base Building Mech/Elect		\$34.05	\$34.05		

Return on Investment Analysis

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	1998 Return on Investment	2003 Return on Investment	1998 Return on Investment	2003 Return on Investment	1998 Return on Investment	2003 Return on Investment	
\$6.00	-36.4%	111.4%	-28.6%	135.8%	-7.3%	204.6%	\$6.00
\$9.00	-26.2%	144.2%	-18.5%	168.6%	2.8%	237.4%	\$9.00
\$12.00	-16.1%	177.0%	-8.3%	201.4%	13.0%	270.2%	\$12.00
\$15.00	-6.0%	209.7%	1.8%	234.1%	23.1%	302.9%	\$15.00
\$18.00	4.2%	242.5%	11.9%	266.9%	33.2%	335.7%	\$18.00
\$21.00	14.3%	275.3%	22.1%	299.7%	43.4%	368.5%	\$21.00
\$24.00	24.4%	308.0%	32.2%	332.4%	53.5%	401.2%	\$24.00
\$27.00	34.6%	340.8%	42.3%	365.2%	63.6%	434.0%	\$27.00
\$30.00	44.7%	373.6%	52.5%	398.0%	73.8%	466.8%	\$30.00
\$33.00	54.8%	406.3%	62.6%	430.7%	83.9%	499.5%	\$33.00
\$36.00	65.0%	439.1%	72.7%	463.5%	94.0%	532.3%	\$36.00
\$39.00	75.1%	471.9%	82.9%	496.3%	104.2%	565.1%	\$39.00
\$42.00	85.2%	504.6%	93.0%	529.0%	114.3%	597.8%	\$42.00
\$45.00	95.4%	537.4%	103.1%	561.8%	124.4%	630.6%	\$45.00

Table 8.3 compares for workstation Type 2 - Carrel with a 15-inch FPM the 1998 and 2003 ROI results for various rental rates, under Scenarios A, B, and C.

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8. Financial Analysis

8.4 Workstation Type 3 - Hub and Spoke

Workstation Areas	USF	RSF	RSF Saved / Wrkstn	Assumptions	
Benchmark Workstation	48.88	56.21		USF to RSF Markup	1.15
Modified Workstation	44.79	51.51	4.70	Interest Rate	8.50%
				Flat Panel Monitor Term (Yrs)	5
				Furniture Term (Yrs)	5
				Tenant Constr Term (Yrs)	5
				Base Bldg Constr Term (Yrs)	20
15-inch Flat Panel Monitor (Per Workstation)		\$160.00	\$49.48		
				Add'l Tenant Fit-Out Cost	
				1998	2003
				\$9.07	\$8.80
Savings (per workstation)					
Electrical Energy		\$26.74	\$25.25		
Furniture		\$60.90	\$16.49		
Tenant Fit-Out		\$10.83	\$10.50		
Base Building Mech/Elect		\$48.15	\$48.15		

Return on Investment Analysis

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	1998	2003	1998	2003	1998	2003	
	Return on Investment	Return on Investment	Return on Investment	Return on Investment	Return on Investment	Return on Investment	
\$6.00	-27.6%	41.4%	-20.8%	62.6%	9.3%	159.9%	\$6.00
\$9.00	-18.8%	69.9%	-12.0%	91.1%	18.1%	188.4%	\$9.00
\$12.00	-9.9%	98.4%	-3.2%	119.6%	26.9%	217.0%	\$12.00
\$15.00	-1.1%	126.9%	5.6%	148.2%	35.7%	245.5%	\$15.00
\$18.00	7.7%	155.5%	14.5%	176.7%	44.6%	274.0%	\$18.00
\$21.00	16.5%	184.0%	23.3%	205.2%	53.4%	302.5%	\$21.00
\$24.00	25.3%	212.5%	32.1%	233.7%	62.2%	331.0%	\$24.00
\$27.00	34.1%	241.0%	40.9%	262.2%	71.0%	359.5%	\$27.00
\$30.00	43.0%	269.5%	49.7%	290.7%	79.8%	388.0%	\$30.00
\$33.00	51.8%	298.0%	58.6%	319.3%	88.6%	416.6%	\$33.00
\$36.00	60.6%	326.5%	67.4%	347.8%	97.5%	445.1%	\$36.00
\$39.00	69.4%	355.1%	76.2%	376.3%	106.3%	473.6%	\$39.00
\$42.00	78.2%	383.6%	85.0%	404.8%	115.1%	502.1%	\$42.00
\$45.00	87.1%	412.1%	93.8%	433.3%	123.9%	530.6%	\$45.00

Table 8.4 compares for workstation Type 3 - Hub and Spoke with a 15-inch FPM the 1998 and 2003 ROI results for various rental rates,, under Scenarios A, B, and C.

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8. Financial Analysis

8.5 Workstation Type 4 - Sawtooth

Workstation Areas	USF	RSF	RSF Saved		Assumptions
			/ Wrkstn		
Benchmark Workstation	58.09	66.80			USF to RSF Markup 1.15
Modified Workstation	52.63	60.52	6.28		Interest Rate 8.50%
			1998	2003	Flat Panel Monitor Term (Yrs) 5
			Cost	Cost	Furniture Term (Yrs) 5
			/Year	/Year	Tenant Constr Term (Yrs) 5
15-inch Flat Panel Monitor (Per Workstation)		\$160.00	\$49.48		Base Bldg Constr Term (Yrs) 20
			1998	2003	Add'l Tenant Fit-Out Cost
			Savings	Savings	1998
			/Year	/Year	2003
Savings (per workstation)					\$9.07
Electrical Energy		\$26.74	\$25.25		\$8.80
Furniture		\$100.75	\$40.60		
Tenant Fit-Out		\$14.45	\$14.02		
Base Building Mech/Elect		\$57.62	\$57.62		

Return on Investment Analysis

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	1998 Return on Investment	2003 Return on Investment	1998 Return on Investment	2003 Return on Investment	1998 Return on Investment	2003 Return on Investment	
\$6.00	3.2%	109.2%	12.3%	137.5%	45.0%	243.4%	\$6.00
\$9.00	15.0%	147.3%	24.0%	175.6%	55.1%	276.2%	\$9.00
\$12.00	26.8%	185.3%	35.8%	213.7%	65.3%	308.9%	\$12.00
\$15.00	38.5%	223.4%	47.6%	251.7%	75.4%	341.7%	\$15.00
\$18.00	50.3%	261.5%	59.3%	289.8%	85.5%	374.5%	\$18.00
\$21.00	62.1%	299.5%	71.1%	327.9%	95.7%	407.2%	\$21.00
\$24.00	73.9%	337.6%	82.9%	365.9%	105.8%	440.0%	\$24.00
\$27.00	85.6%	375.7%	94.7%	404.0%	115.9%	472.8%	\$27.00
\$30.00	97.4%	413.7%	106.4%	442.1%	126.1%	505.5%	\$30.00
\$33.00	109.2%	451.8%	118.2%	480.1%	136.2%	538.3%	\$33.00
\$36.00	121.0%	489.9%	130.0%	518.2%	146.3%	571.1%	\$36.00
\$39.00	132.7%	527.9%	141.8%	556.3%	156.5%	603.8%	\$39.00
\$42.00	144.5%	566.0%	153.5%	594.3%	166.6%	636.6%	\$42.00
\$45.00	156.3%	604.1%	165.3%	632.4%	176.7%	669.4%	\$45.00

Table 8.5 compares for workstation Type 4 - Sawtooth with a 15-inch FPM the 1998 and 2003 ROI results for various rental rates, under Scenarios A, B, and C.

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8. Financial Analysis

8.6 Workstation Type 5 - Small Cubicle

Workstation Areas	USF	RSF	RSF Saved		Assumptions
			/ Wrkstn		
Benchmark Workstation	54.68	62.88			USF to RSF Markup 1.15
Modified Workstation	47.53	54.66	8.22		Interest Rate 8.50%
			1998	2003	Flat Panel Monitor Term (Yrs) 5
			Cost	Cost	Furniture Term (Yrs) 5
			/Year	/Year	Tenant Constr Term (Yrs) 5
15-inch Flat Panel Monitor (Per Workstation)		\$160.00	\$49.48		Base Bldg Constr Term (Yrs) 20
					Add'l Tenant Fit-Out Cost
			1998	2003	
			Savings	Savings	1998
			/Year	/Year	2003
Savings (per workstation)					\$9.07
Electrical Energy		\$26.74	\$25.25		\$8.80
Furniture		\$212.15	\$32.99		
Tenant Fit-Out		\$18.93	\$18.36		
Base Building Mech/Elect		\$55.55	\$55.55		

Return on Investment Analysis

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	1998	2003	1998	2003	1998	2003	
	Return on Investment	Return on Investment	Return on Investment	Return on Investment	Return on Investment	Return on Investment	
\$6.00	80.1%	117.4%	92.0%	154.5%	126.7%	266.8%	\$6.00
\$9.00	95.6%	167.2%	107.4%	204.3%	142.1%	316.6%	\$9.00
\$12.00	111.0%	217.1%	122.8%	254.2%	157.5%	366.5%	\$12.00
\$15.00	126.4%	266.9%	138.2%	304.0%	172.9%	416.3%	\$15.00
\$18.00	141.8%	316.8%	153.6%	353.9%	188.4%	466.2%	\$18.00
\$21.00	157.2%	366.6%	169.1%	403.7%	203.8%	516.0%	\$21.00
\$24.00	172.6%	416.5%	184.5%	453.6%	219.2%	565.9%	\$24.00
\$27.00	188.1%	466.3%	199.9%	503.4%	234.6%	615.7%	\$27.00
\$30.00	203.5%	516.2%	215.3%	553.3%	250.0%	665.6%	\$30.00
\$33.00	218.9%	566.0%	230.7%	603.1%	265.4%	715.4%	\$33.00
\$36.00	234.3%	615.9%	246.1%	653.0%	280.9%	765.3%	\$36.00
\$39.00	249.7%	665.7%	261.6%	702.8%	296.3%	815.1%	\$39.00
\$42.00	265.1%	715.6%	277.0%	752.7%	311.7%	865.0%	\$42.00
\$45.00	280.6%	765.4%	292.4%	802.5%	327.1%	914.8%	\$45.00

Table 8.6 compares for workstation Type 5 - Small Cubicle with a 15-inch FPM the 1998 and 2003 ROI results for various rental rates, under Scenarios A, B, and C.

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8. Financial Analysis

8.8 Workstation Type 7 - Medium Cubicle

Workstation Areas	USF	RSF	RSF Saved / Wrkstn	Assumptions	
				1998	2003
Benchmark Workstation	68.79	79.11	8.11	USF to RSF Markup	1.15
Modified Workstation	61.74	71.00		Interest Rate	8.50%
				Flat Panel Monitor Term (Yrs)	5
				Furniture Term (Yrs)	5
				Tenant Constr Term (Yrs)	5
				Base Bldg Constr Term (Yrs)	20
15-inch Flat Panel Monitor (Per Workstation)		\$160.00	\$49.48	Addtl Tenant Fit-Out Cost	
				1998	2003
				\$9.07	\$8.80
Savings (per workstation)					
Electrical Energy		\$26.74	\$25.25		
Furniture		\$126.88	\$25.38		
Tenant Fit-Out		\$18.66	\$18.11		
Base Building Mech/Elect		\$68.62	\$68.62		

Return on Investment Analysis

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	1998	2003	1998	2003	1998	2003	
	Return on Investment	Return on Investment	Return on Investment	Return on Investment	Return on Investment	Return on Investment	
\$6.00	26.4%	100.6%	38.1%	137.2%	81.0%	275.9%	\$6.00
\$9.00	41.6%	149.8%	53.3%	186.4%	96.2%	325.0%	\$9.00
\$12.00	56.8%	198.9%	68.5%	235.5%	111.4%	374.2%	\$12.00
\$15.00	72.0%	248.1%	83.7%	284.7%	126.6%	423.3%	\$15.00
\$18.00	87.2%	297.2%	98.9%	333.8%	141.8%	472.5%	\$18.00
\$21.00	102.4%	346.4%	114.1%	383.0%	157.0%	521.6%	\$21.00
\$24.00	117.6%	395.5%	129.3%	432.1%	172.2%	570.8%	\$24.00
\$27.00	132.8%	444.7%	144.5%	481.3%	187.4%	619.9%	\$27.00
\$30.00	148.0%	493.8%	159.7%	530.4%	202.6%	669.1%	\$30.00
\$33.00	163.2%	543.0%	174.9%	579.6%	217.8%	718.2%	\$33.00
\$36.00	178.4%	592.1%	190.1%	628.7%	233.0%	767.4%	\$36.00
\$39.00	193.6%	641.3%	205.3%	677.9%	248.2%	816.5%	\$39.00
\$42.00	208.8%	690.4%	220.5%	727.0%	263.4%	865.7%	\$42.00
\$45.00	224.0%	739.6%	235.7%	776.2%	278.6%	914.8%	\$45.00

Table 8.8 compares for workstation Type 7 - Medium Cubicle with a 15-inch FPM the 1998 and 2003 ROI results for various rental rates, under Scenarios A, B, and C.

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9. Additional Considerations

9.1 FPM Longevity

Preliminary studies show that FPMs have a longer useful life than CRT monitors for several reasons:

- They operate at lower temperatures.
- They do not suffer from “screen burn,” when permanent shadows of images appear on the screen.
- LCD technology is more reliable.

Obviously, the longer lifespan of the FPMs could result in additional cost savings.

9.2 Monitor Adjustability - FPM Arms

For proper ergonomic operation of computers, it is necessary to adjust the height and tilt of the monitor based on the size and position preferences of the user. There are essentially two options for the heavier, CRT monitors: adjustable blocks that rest on the worksurface; and cantilevered arms that are usually bolted to the worksurface. Although the cantilevered arms are heavy and more expensive, they do permit functional use of the worksurface behind the keyboard and under the monitor. The use of this space is fairly limited, however, because the distance from the bottom of the screen to the base of a CRT monitor is usually only 6 inches.

There are two distinct advantages with the use of the FPM. First, the FPM is much lighter than a CRT and therefore, easier to adjust. Second, the distance from the bottom of the screen to the bottom of the FPM is only 2 inches. This allows for increased height between the worksurface and the bottom of the monitor in the area under the monitor and immediately behind the keyboard, which is premium worksurface due to its proximity to the user. If the worksurface behind the keyboard is adjusted to the same height as the bottom of the keyboard, the clearance between the bottom of the monitor and the worksurface ranges between 12 and 14 inches.

9. Additional Considerations

Several FPM Arms are currently available that allow the user to effortlessly tilt, rotate, or swivel the FPM to suit individual preferences. Some arms even allow for horizontal (landscape) and vertical (portrait) positioning of the monitor. FPM Arms may utilize desk clamps, slatwall mounting interfaces, or a freestanding base using minimal space. Benefits include even more available desk space - even on a 24-inch deep worksurface, unequalled ergonomic adjustability, and a clutter-free, high-tech appearance. Users who spend time at their workstations working with the computer and interacting with people can also benefit from FPM Arms that place the monitor unobtrusively out of the way when it is not needed and in the proper position when it is needed.

9.3 Potential to Eliminate HVAC Modifications

Due to the increased heat loads from people and computers, renovation of existing buildings for high-density office spaces almost always requires installation of supplemental air conditioning units. As an example, a 190-seat call center installed in a new, speculative office building in Reno, Nevada, required an additional 15-ton air conditioning unit (one ton per 1,000 sq. ft.). The solution involved reinforcing the roof structure, installing a new roof unit, and a duct loop serving the building core.

In many existing buildings with functioning air conditioning systems, it is difficult, and therefore expensive, to modify or supplement the air conditioning systems. The use of FPMs may reduce the heat load sufficiently to prevent the need for major changes to existing air conditioning systems.

9. Additional Considerations

9.4 Comfort, Productivity and Health

The quality of the FPM is generally considered to be superior to that of the CRT. One of the primary reasons is that the CRT projects moving images that result in pixel instability on the display screen, a problem not found with FPMs. In addition, FPMs are more tolerant to a variety of daylighting and electrical lighting conditions. This is because the matte finish on the FPM is less reflective than the glass screen on the CRT. As a consequence, there is potential, through the use of FPMs to reduce eyestrain problems and therefore, improve occupancy comfort and increase productivity.

Additionally, FPMs offer health-related benefits, since they do not radiate electromagnetic rays like CRTs, and emissions that could negatively affect occupancy health and the environment.

10. Conclusions - Discussion

This study updates the research completed in 1998 by KSBA Architects that confirmed the potential for facility operating savings through the use of FPMs in high-density, open plan office environments. The earlier study was based on the hypothesis that even though FPMs are more expensive than CRTs, facility savings could financially justify their use. This argument is even stronger today since FPM prices have dropped significantly during the last 1-2 years, and as a result, the cost premium over CRTs is quickly evaporating.

Thus, the energy, furniture and construction cost analysis confirmed that:

- a. FPMs use approximately 60% less energy than the average equivalent CRTs;
- b. workstations designed for the smaller FPMs, while maintaining the same *functional worksurface area* are 10% to 20% smaller, and;
- c. larger workstations offer greater savings potential.

The financial results clearly demonstrate that, when approached holistically, the use of FPMs in high-density workplaces can save money. This is particularly true with larger workstations in new buildings, where the full savings potential can be realized.

Finally, additional parameters, that are beyond the scope of this study, but offer substantial savings opportunities, should not be underestimated. These parameters include the superior quality of the FPM (eliminates screen flicker) that leads to improved occupancy comfort and productivity through reduced eyestrain; the longer lifespan of the FPM; and, the potential to sufficiently reduce heat loads to prevent the need for expensive modifications of existing mechanical systems.

Analysis of Facility Cost Savings Associated with Flat Panel Monitors

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Appendix A - Definitions

Benchmark Workstation

One of the seven workstation configurations selected by the researchers as representative examples of workstations typically found in high-density, information and technology-based office environments.

Cathode Ray Tube (CRT)

Computer monitor employing a Cathode Ray Tube which projects images onto a glass screen. Generally, the depth of the monitor is equal to, or slightly greater than, the diagonal dimension of the CRT.

Central Circulation

Circulation between clusters of workstations to which local circulation connects.

Functional Worksurface Area

Worksurface area with depth between 12 and 24 inches. Any worksurface area that is less than 12 inches deep, as well as any portion of a worksurface greater than 24 inches deep is excluded.

Gross Rent

Full rental rate including building owner's debt service and profit, taxes and insurance, utilities, maintenance and amortization of tenant fit-out costs.

Flat Panel Monitor (FPM)

Computer monitor that uses Liquid Crystal Display (LCD) technology allowing monitor depth less than 3 inches. Also known as LCD monitor.

Modified Workstation

Benchmark workstation modified with the use of FPM to eliminate space primarily necessary because of the greater depth of a CRT monitor.

Local Circulation

Common circulation space immediately adjacent to a workstation.

Rentable Square Feet (RSF)

Usable square footage plus a markup factor (usually ranging between 10% and 20%) for areas of a multi-tenant building not directly controlled by the tenant

Appendix A - Definitions

from which the tenant benefits. These areas might include common restrooms, elevator lobbies, janitor closets, mechanical rooms, etc.

Standing Area

That portion of a workstation not occupied by work surface or filing. Includes any areas where people can stand at the workstation with the chair(s) removed.

Tenant Fit-Out

Construction work completed for the benefit of individual tenants. Tenant fit-out work usually includes extension into the tenant space, of mechanical and electrical systems, as well as interior finishes such as walls, doors, ceilings and flooring. However, tenant fit-out for higher density, information/technology office space often requires modifications to existing base building systems, particularly in older buildings not designed for higher density occupancy.

Tenant Standard Workletter

The scope or extent of tenant fit-out offered by the building owner as the "standard" for the building. The cost of the construction work defined by the *tenant standard workletter* is included in the gross rent. *Tenant standard workletter* can be defined in terms of dollars per square foot available to the tenant for construction of the space or "bricks and mortar" where actual quantities of various construction components are defined.

Usable Square Feet (USF)

Floor area used exclusively by the tenant.



**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**15-inch FPM
Workstation Type 1 - Training Room**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$13.30	26.9%	\$23.83	48.2%	\$55.12	111.4%	\$5.00
\$6.00	\$18.01	36.4%	\$28.54	57.7%	\$59.84	120.9%	\$6.00
\$7.00	\$22.73	45.9%	\$33.26	67.2%	\$64.55	130.4%	\$7.00
\$8.00	\$27.44	55.5%	\$37.97	76.7%	\$69.27	140.0%	\$8.00
\$9.00	\$32.16	65.0%	\$42.69	86.3%	\$73.98	149.5%	\$9.00
\$10.00	\$36.87	74.5%	\$47.40	95.8%	\$78.70	159.0%	\$10.00
\$11.00	\$41.59	84.0%	\$52.12	105.3%	\$83.41	168.6%	\$11.00
\$12.00	\$46.30	93.6%	\$56.83	114.8%	\$88.13	178.1%	\$12.00
\$13.00	\$51.02	103.1%	\$61.55	124.4%	\$92.84	187.6%	\$13.00
\$14.00	\$55.73	112.6%	\$66.26	133.9%	\$97.56	197.1%	\$14.00
\$15.00	\$60.45	122.2%	\$70.98	143.4%	\$102.27	206.7%	\$15.00
\$16.00	\$65.16	131.7%	\$75.69	153.0%	\$106.99	216.2%	\$16.00
\$17.00	\$69.88	141.2%	\$80.41	162.5%	\$111.70	225.7%	\$17.00
\$18.00	\$74.59	150.7%	\$85.12	172.0%	\$116.42	235.3%	\$18.00
\$19.00	\$79.31	160.3%	\$89.84	181.5%	\$121.13	244.8%	\$19.00
\$20.00	\$84.02	169.8%	\$94.55	191.1%	\$125.85	254.3%	\$20.00
\$21.00	\$88.74	179.3%	\$99.27	200.6%	\$130.56	263.8%	\$21.00
\$22.00	\$93.45	188.9%	\$103.98	210.1%	\$135.28	273.4%	\$22.00
\$23.00	\$98.17	198.4%	\$108.70	219.7%	\$139.99	282.9%	\$23.00
\$24.00	\$102.88	207.9%	\$113.41	229.2%	\$144.71	292.4%	\$24.00
\$25.00	\$107.60	217.4%	\$118.13	238.7%	\$149.42	302.0%	\$25.00
\$26.00	\$112.31	227.0%	\$122.84	248.2%	\$154.14	311.5%	\$26.00
\$27.00	\$117.03	236.5%	\$127.56	257.8%	\$158.85	321.0%	\$27.00
\$28.00	\$121.74	246.0%	\$132.27	267.3%	\$163.57	330.5%	\$28.00
\$29.00	\$126.46	255.6%	\$136.99	276.8%	\$168.28	340.1%	\$29.00
\$30.00	\$131.17	265.1%	\$141.70	286.4%	\$173.00	349.6%	\$30.00
\$31.00	\$135.89	274.6%	\$146.42	295.9%	\$177.71	359.1%	\$31.00
\$32.00	\$140.60	284.1%	\$151.13	305.4%	\$182.43	368.7%	\$32.00
\$33.00	\$145.32	293.7%	\$155.85	314.9%	\$187.14	378.2%	\$33.00
\$34.00	\$150.03	303.2%	\$160.56	324.5%	\$191.86	387.7%	\$34.00
\$35.00	\$154.75	312.7%	\$165.28	334.0%	\$196.57	397.2%	\$35.00
\$36.00	\$159.46	322.2%	\$169.99	343.5%	\$201.29	406.8%	\$36.00
\$37.00	\$164.18	331.8%	\$174.71	353.1%	\$206.00	416.3%	\$37.00
\$38.00	\$168.89	341.3%	\$179.42	362.6%	\$210.72	425.8%	\$38.00
\$39.00	\$173.61	350.8%	\$184.14	372.1%	\$215.43	435.4%	\$39.00
\$40.00	\$178.32	360.4%	\$188.85	381.6%	\$220.15	444.9%	\$40.00
\$41.00	\$183.04	369.9%	\$193.57	391.2%	\$224.86	454.4%	\$41.00
\$42.00	\$187.75	379.4%	\$198.28	400.7%	\$229.58	463.9%	\$42.00
\$43.00	\$192.47	388.9%	\$203.00	410.2%	\$234.29	473.5%	\$43.00
\$44.00	\$197.18	398.5%	\$207.71	419.8%	\$239.01	483.0%	\$44.00
\$45.00	\$201.90	408.0%	\$212.43	429.3%	\$243.72	492.5%	\$45.00

Table indicating for workstation Type 1 - Training Room the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**15-inch FPM
Workstation Type 2 - Carrel**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$49.74	100.5%	\$61.81	124.9%	\$95.86	193.7%	\$5.00
\$6.00	\$55.14	111.4%	\$67.21	135.8%	\$101.26	204.6%	\$6.00
\$7.00	\$60.55	122.4%	\$72.62	146.7%	\$106.67	215.6%	\$7.00
\$8.00	\$65.95	133.3%	\$78.02	157.7%	\$112.07	226.5%	\$8.00
\$9.00	\$71.36	144.2%	\$83.43	168.6%	\$117.48	237.4%	\$9.00
\$10.00	\$76.76	155.1%	\$88.83	179.5%	\$122.88	248.3%	\$10.00
\$11.00	\$82.17	166.0%	\$94.24	190.4%	\$128.29	259.2%	\$11.00
\$12.00	\$87.57	177.0%	\$99.64	201.4%	\$133.69	270.2%	\$12.00
\$13.00	\$92.98	187.9%	\$105.05	212.3%	\$139.10	281.1%	\$13.00
\$14.00	\$98.38	198.8%	\$110.45	223.2%	\$144.50	292.0%	\$14.00
\$15.00	\$103.79	209.7%	\$115.86	234.1%	\$149.91	302.9%	\$15.00
\$16.00	\$109.19	220.7%	\$121.26	245.1%	\$155.31	313.9%	\$16.00
\$17.00	\$114.60	231.6%	\$126.67	256.0%	\$160.72	324.8%	\$17.00
\$18.00	\$120.00	242.5%	\$132.07	266.9%	\$166.12	335.7%	\$18.00
\$19.00	\$125.41	253.4%	\$137.48	277.8%	\$171.53	346.6%	\$19.00
\$20.00	\$130.81	264.4%	\$142.88	288.7%	\$176.93	357.6%	\$20.00
\$21.00	\$136.22	275.3%	\$148.29	299.7%	\$182.34	368.5%	\$21.00
\$22.00	\$141.62	286.2%	\$153.69	310.6%	\$187.74	379.4%	\$22.00
\$23.00	\$147.03	297.1%	\$159.10	321.5%	\$193.15	390.3%	\$23.00
\$24.00	\$152.43	308.0%	\$164.50	332.4%	\$198.55	401.2%	\$24.00
\$25.00	\$157.84	319.0%	\$169.91	343.4%	\$203.96	412.2%	\$25.00
\$26.00	\$163.24	329.9%	\$175.31	354.3%	\$209.36	423.1%	\$26.00
\$27.00	\$168.65	340.8%	\$180.72	365.2%	\$214.77	434.0%	\$27.00
\$28.00	\$174.05	351.7%	\$186.12	376.1%	\$220.17	444.9%	\$28.00
\$29.00	\$179.46	362.7%	\$191.53	387.0%	\$225.58	455.9%	\$29.00
\$30.00	\$184.86	373.6%	\$196.93	398.0%	\$230.98	466.8%	\$30.00
\$31.00	\$190.27	384.5%	\$202.34	408.9%	\$236.39	477.7%	\$31.00
\$32.00	\$195.67	395.4%	\$207.74	419.8%	\$241.79	488.6%	\$32.00
\$33.00	\$201.08	406.3%	\$213.15	430.7%	\$247.20	499.5%	\$33.00
\$34.00	\$206.48	417.3%	\$218.55	441.7%	\$252.60	510.5%	\$34.00
\$35.00	\$211.89	428.2%	\$223.96	452.6%	\$258.01	521.4%	\$35.00
\$36.00	\$217.29	439.1%	\$229.36	463.5%	\$263.41	532.3%	\$36.00
\$37.00	\$222.70	450.0%	\$234.77	474.4%	\$268.82	543.2%	\$37.00
\$38.00	\$228.10	461.0%	\$240.17	485.4%	\$274.22	554.2%	\$38.00
\$39.00	\$233.51	471.9%	\$245.58	496.3%	\$279.63	565.1%	\$39.00
\$40.00	\$238.91	482.8%	\$250.98	507.2%	\$285.03	576.0%	\$40.00
\$41.00	\$244.32	493.7%	\$256.39	518.1%	\$290.44	586.9%	\$41.00
\$42.00	\$249.72	504.6%	\$261.79	529.0%	\$295.84	597.8%	\$42.00
\$43.00	\$255.13	515.6%	\$267.20	540.0%	\$301.25	608.8%	\$43.00
\$44.00	\$260.53	526.5%	\$272.60	550.9%	\$306.65	619.7%	\$44.00
\$45.00	\$265.94	537.4%	\$278.01	561.8%	\$312.06	630.6%	\$45.00

Table indicating for workstation Type 2 - Carrel the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**15-inch FPM
Workstation Type 3 - Hub and Spoke**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$15.78	31.9%	\$26.28	53.1%	\$74.44	150.4%	\$5.00
\$6.00	\$20.48	41.4%	\$30.99	62.6%	\$79.14	159.9%	\$6.00
\$7.00	\$25.18	50.9%	\$35.69	72.1%	\$83.84	169.4%	\$7.00
\$8.00	\$29.89	60.4%	\$40.39	81.6%	\$88.55	178.9%	\$8.00
\$9.00	\$34.59	69.9%	\$45.10	91.1%	\$93.25	188.4%	\$9.00
\$10.00	\$39.30	79.4%	\$49.80	100.6%	\$97.95	197.9%	\$10.00
\$11.00	\$44.00	88.9%	\$54.50	110.1%	\$102.66	207.5%	\$11.00
\$12.00	\$48.70	98.4%	\$59.21	119.6%	\$107.36	217.0%	\$12.00
\$13.00	\$53.41	107.9%	\$63.91	129.2%	\$112.06	226.5%	\$13.00
\$14.00	\$58.11	117.4%	\$68.61	138.7%	\$116.77	236.0%	\$14.00
\$15.00	\$62.81	126.9%	\$73.32	148.2%	\$121.47	245.5%	\$15.00
\$16.00	\$67.52	136.4%	\$78.02	157.7%	\$126.17	255.0%	\$16.00
\$17.00	\$72.22	145.9%	\$82.72	167.2%	\$130.88	264.5%	\$17.00
\$18.00	\$76.92	155.5%	\$87.43	176.7%	\$135.58	274.0%	\$18.00
\$19.00	\$81.63	165.0%	\$92.13	186.2%	\$140.28	283.5%	\$19.00
\$20.00	\$86.33	174.5%	\$96.83	195.7%	\$144.99	293.0%	\$20.00
\$21.00	\$91.03	184.0%	\$101.54	205.2%	\$149.69	302.5%	\$21.00
\$22.00	\$95.74	193.5%	\$106.24	214.7%	\$154.40	312.0%	\$22.00
\$23.00	\$100.44	203.0%	\$110.94	224.2%	\$159.10	321.5%	\$23.00
\$24.00	\$105.14	212.5%	\$115.65	233.7%	\$163.80	331.0%	\$24.00
\$25.00	\$109.85	222.0%	\$120.35	243.2%	\$168.51	340.5%	\$25.00
\$26.00	\$114.55	231.5%	\$125.06	252.7%	\$173.21	350.0%	\$26.00
\$27.00	\$119.25	241.0%	\$129.76	262.2%	\$177.91	359.5%	\$27.00
\$28.00	\$123.96	250.5%	\$134.46	271.7%	\$182.62	369.0%	\$28.00
\$29.00	\$128.66	260.0%	\$139.17	281.2%	\$187.32	378.5%	\$29.00
\$30.00	\$133.37	269.5%	\$143.87	290.7%	\$192.02	388.0%	\$30.00
\$31.00	\$138.07	279.0%	\$148.57	300.2%	\$196.73	397.6%	\$31.00
\$32.00	\$142.77	288.5%	\$153.28	309.7%	\$201.43	407.1%	\$32.00
\$33.00	\$147.48	298.0%	\$157.98	319.3%	\$206.13	416.6%	\$33.00
\$34.00	\$152.18	307.5%	\$162.68	328.8%	\$210.84	426.1%	\$34.00
\$35.00	\$156.88	317.0%	\$167.39	338.3%	\$215.54	435.6%	\$35.00
\$36.00	\$161.59	326.5%	\$172.09	347.8%	\$220.24	445.1%	\$36.00
\$37.00	\$166.29	336.0%	\$176.79	357.3%	\$224.95	454.6%	\$37.00
\$38.00	\$170.99	345.6%	\$181.50	366.8%	\$229.65	464.1%	\$38.00
\$39.00	\$175.70	355.1%	\$186.20	376.3%	\$234.35	473.6%	\$39.00
\$40.00	\$180.40	364.6%	\$190.90	385.8%	\$239.06	483.1%	\$40.00
\$41.00	\$185.10	374.1%	\$195.61	395.3%	\$243.76	492.6%	\$41.00
\$42.00	\$189.81	383.6%	\$200.31	404.8%	\$248.47	502.1%	\$42.00
\$43.00	\$194.51	393.1%	\$205.01	414.3%	\$253.17	511.6%	\$43.00
\$44.00	\$199.21	402.6%	\$209.72	423.8%	\$257.87	521.1%	\$44.00
\$45.00	\$203.92	412.1%	\$214.42	433.3%	\$262.58	530.6%	\$45.00

Table indicating for workstation Type 3 - Hub and Spoke the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
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Appendix B - Financial Results

**15-inch FPM
Workstation Type 4 - Sawtooth**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$47.76	96.5%	\$61.79	124.9%	\$119.40	232.5%	\$5.00
\$6.00	\$54.04	109.2%	\$68.06	137.5%	\$125.68	243.4%	\$6.00
\$7.00	\$60.32	121.9%	\$74.34	150.2%	\$131.96	254.3%	\$7.00
\$8.00	\$66.60	134.6%	\$80.62	162.9%	\$138.24	265.2%	\$8.00
\$9.00	\$72.88	147.3%	\$86.90	175.6%	\$144.52	276.2%	\$9.00
\$10.00	\$79.16	160.0%	\$93.18	188.3%	\$150.80	287.1%	\$10.00
\$11.00	\$85.44	172.7%	\$99.46	201.0%	\$157.08	298.0%	\$11.00
\$12.00	\$91.72	185.3%	\$105.74	213.7%	\$163.36	308.9%	\$12.00
\$13.00	\$98.00	198.0%	\$112.02	226.4%	\$169.64	319.8%	\$13.00
\$14.00	\$104.27	210.7%	\$118.30	239.1%	\$175.92	330.8%	\$14.00
\$15.00	\$110.55	223.4%	\$124.58	251.7%	\$182.19	341.7%	\$15.00
\$16.00	\$116.83	236.1%	\$130.85	264.4%	\$188.47	352.6%	\$16.00
\$17.00	\$123.11	248.8%	\$137.13	277.1%	\$194.75	363.5%	\$17.00
\$18.00	\$129.39	261.5%	\$143.41	289.8%	\$201.03	374.5%	\$18.00
\$19.00	\$135.67	274.2%	\$149.69	302.5%	\$207.31	385.4%	\$19.00
\$20.00	\$141.95	286.9%	\$155.97	315.2%	\$213.59	396.3%	\$20.00
\$21.00	\$148.23	299.5%	\$162.25	327.9%	\$219.87	407.2%	\$21.00
\$22.00	\$154.51	312.2%	\$168.53	340.6%	\$226.15	418.2%	\$22.00
\$23.00	\$160.79	324.9%	\$174.81	353.3%	\$232.43	429.1%	\$23.00
\$24.00	\$167.06	337.6%	\$181.09	365.9%	\$238.71	440.0%	\$24.00
\$25.00	\$173.34	350.3%	\$187.37	378.6%	\$244.98	450.9%	\$25.00
\$26.00	\$179.62	363.0%	\$193.64	391.3%	\$251.26	461.8%	\$26.00
\$27.00	\$185.90	375.7%	\$199.92	404.0%	\$257.54	472.8%	\$27.00
\$28.00	\$192.18	388.4%	\$206.20	416.7%	\$263.82	483.7%	\$28.00
\$29.00	\$198.46	401.1%	\$212.48	429.4%	\$270.10	494.6%	\$29.00
\$30.00	\$204.74	413.7%	\$218.76	442.1%	\$276.38	505.5%	\$30.00
\$31.00	\$211.02	426.4%	\$225.04	454.8%	\$282.66	516.5%	\$31.00
\$32.00	\$217.30	439.1%	\$231.32	467.5%	\$288.94	527.4%	\$32.00
\$33.00	\$223.58	451.8%	\$237.60	480.1%	\$295.22	538.3%	\$33.00
\$34.00	\$229.85	464.5%	\$243.88	492.8%	\$301.50	549.2%	\$34.00
\$35.00	\$236.13	477.2%	\$250.16	505.5%	\$307.77	560.1%	\$35.00
\$36.00	\$242.41	489.9%	\$256.43	518.2%	\$314.05	571.1%	\$36.00
\$37.00	\$248.69	502.6%	\$262.71	530.9%	\$320.33	582.0%	\$37.00
\$38.00	\$254.97	515.3%	\$268.99	543.6%	\$326.61	592.9%	\$38.00
\$39.00	\$261.25	527.9%	\$275.27	556.3%	\$332.89	603.8%	\$39.00
\$40.00	\$267.53	540.6%	\$281.55	569.0%	\$339.17	614.8%	\$40.00
\$41.00	\$273.81	553.3%	\$287.83	581.7%	\$345.45	625.7%	\$41.00
\$42.00	\$280.09	566.0%	\$294.11	594.3%	\$351.73	636.6%	\$42.00
\$43.00	\$286.37	578.7%	\$300.39	607.0%	\$358.01	647.5%	\$43.00
\$44.00	\$292.64	591.4%	\$306.67	619.7%	\$364.29	658.4%	\$44.00
\$45.00	\$298.92	604.1%	\$312.95	632.4%	\$370.56	669.4%	\$45.00

Table indicating for workstation Type 4 - Sawtooth the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**15-inch FPM
Workstation Type 5 - Small Cubicle**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$49.87	100.8%	\$68.23	137.9%	\$123.78	250.1%	\$5.00
\$6.00	\$58.09	117.4%	\$76.45	154.5%	\$132.01	266.8%	\$6.00
\$7.00	\$66.31	134.0%	\$84.67	171.1%	\$140.23	283.4%	\$7.00
\$8.00	\$74.54	150.6%	\$92.90	187.7%	\$148.45	300.0%	\$8.00
\$9.00	\$82.76	167.2%	\$101.12	204.3%	\$156.67	316.6%	\$9.00
\$10.00	\$90.98	183.9%	\$109.34	221.0%	\$164.90	333.2%	\$10.00
\$11.00	\$99.20	200.5%	\$117.56	237.6%	\$173.12	349.8%	\$11.00
\$12.00	\$107.43	217.1%	\$125.79	254.2%	\$181.34	366.5%	\$12.00
\$13.00	\$115.65	233.7%	\$134.01	270.8%	\$189.56	383.1%	\$13.00
\$14.00	\$123.87	250.3%	\$142.23	287.4%	\$197.79	399.7%	\$14.00
\$15.00	\$132.09	266.9%	\$150.45	304.0%	\$206.01	416.3%	\$15.00
\$16.00	\$140.32	283.6%	\$158.68	320.7%	\$214.23	432.9%	\$16.00
\$17.00	\$148.54	300.2%	\$166.90	337.3%	\$222.45	449.5%	\$17.00
\$18.00	\$156.76	316.8%	\$175.12	353.9%	\$230.68	466.2%	\$18.00
\$19.00	\$164.98	333.4%	\$183.34	370.5%	\$238.90	482.8%	\$19.00
\$20.00	\$173.21	350.0%	\$191.57	387.1%	\$247.12	499.4%	\$20.00
\$21.00	\$181.43	366.6%	\$199.79	403.7%	\$255.34	516.0%	\$21.00
\$22.00	\$189.65	383.3%	\$208.01	420.4%	\$263.57	532.6%	\$22.00
\$23.00	\$197.87	399.9%	\$216.23	437.0%	\$271.79	549.2%	\$23.00
\$24.00	\$206.10	416.5%	\$224.46	453.6%	\$280.01	565.9%	\$24.00
\$25.00	\$214.32	433.1%	\$232.68	470.2%	\$288.23	582.5%	\$25.00
\$26.00	\$222.54	449.7%	\$240.90	486.8%	\$296.46	599.1%	\$26.00
\$27.00	\$230.76	466.3%	\$249.12	503.4%	\$304.68	615.7%	\$27.00
\$28.00	\$238.99	483.0%	\$257.35	520.1%	\$312.90	632.3%	\$28.00
\$29.00	\$247.21	499.6%	\$265.57	536.7%	\$321.12	648.9%	\$29.00
\$30.00	\$255.43	516.2%	\$273.79	553.3%	\$329.35	665.6%	\$30.00
\$31.00	\$263.65	532.8%	\$282.01	569.9%	\$337.57	682.2%	\$31.00
\$32.00	\$271.88	549.4%	\$290.24	586.5%	\$345.79	698.8%	\$32.00
\$33.00	\$280.10	566.0%	\$298.46	603.1%	\$354.01	715.4%	\$33.00
\$34.00	\$288.32	582.6%	\$306.68	619.8%	\$362.24	732.0%	\$34.00
\$35.00	\$296.54	599.3%	\$314.90	636.4%	\$370.46	748.6%	\$35.00
\$36.00	\$304.77	615.9%	\$323.13	653.0%	\$378.68	765.3%	\$36.00
\$37.00	\$312.99	632.5%	\$331.35	669.6%	\$386.90	781.9%	\$37.00
\$38.00	\$321.21	649.1%	\$339.57	686.2%	\$395.13	798.5%	\$38.00
\$39.00	\$329.43	665.7%	\$347.79	702.8%	\$403.35	815.1%	\$39.00
\$40.00	\$337.66	682.3%	\$356.02	719.5%	\$411.57	831.7%	\$40.00
\$41.00	\$345.88	699.0%	\$364.24	736.1%	\$419.79	848.3%	\$41.00
\$42.00	\$354.10	715.6%	\$372.46	752.7%	\$428.02	865.0%	\$42.00
\$43.00	\$362.32	732.2%	\$380.68	769.3%	\$436.24	881.6%	\$43.00
\$44.00	\$370.55	748.8%	\$388.91	785.9%	\$444.46	898.2%	\$44.00
\$45.00	\$378.77	765.4%	\$397.13	802.5%	\$452.68	914.8%	\$45.00

Table indicating for workstation Type 5 - Small Cubicle the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**15-inch FPM
Workstation Type 6 - Trading Desk**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	-\$6.43	-3.3%	\$21.51	10.9%	\$83.78	42.3%	\$5.00
\$6.00	\$6.08	3.1%	\$34.02	17.2%	\$96.30	48.6%	\$6.00
\$7.00	\$18.59	9.4%	\$46.53	23.5%	\$108.81	55.0%	\$7.00
\$8.00	\$31.10	15.7%	\$59.04	29.8%	\$121.32	61.3%	\$8.00
\$9.00	\$43.61	22.0%	\$71.56	36.2%	\$133.83	67.6%	\$9.00
\$10.00	\$56.13	28.4%	\$84.07	42.5%	\$146.34	73.9%	\$10.00
\$11.00	\$68.64	34.7%	\$96.58	48.8%	\$158.86	80.3%	\$11.00
\$12.00	\$81.15	41.0%	\$109.09	55.1%	\$171.37	86.6%	\$12.00
\$13.00	\$93.66	47.3%	\$121.60	61.4%	\$183.88	92.9%	\$13.00
\$14.00	\$106.17	53.6%	\$134.12	67.8%	\$196.39	99.2%	\$14.00
\$15.00	\$118.69	60.0%	\$146.63	74.1%	\$208.90	105.5%	\$15.00
\$16.00	\$131.20	66.3%	\$159.14	80.4%	\$221.42	111.9%	\$16.00
\$17.00	\$143.71	72.6%	\$171.65	86.7%	\$233.93	118.2%	\$17.00
\$18.00	\$156.22	78.9%	\$184.16	93.0%	\$246.44	124.5%	\$18.00
\$19.00	\$168.73	85.2%	\$196.68	99.4%	\$258.95	130.8%	\$19.00
\$20.00	\$181.25	91.6%	\$209.19	105.7%	\$271.46	137.1%	\$20.00
\$21.00	\$193.76	97.9%	\$221.70	112.0%	\$283.98	143.5%	\$21.00
\$22.00	\$206.27	104.2%	\$234.21	118.3%	\$296.49	149.8%	\$22.00
\$23.00	\$218.78	110.5%	\$246.72	124.6%	\$309.00	156.1%	\$23.00
\$24.00	\$231.29	116.9%	\$259.24	131.0%	\$321.51	162.4%	\$24.00
\$25.00	\$243.81	123.2%	\$271.75	137.3%	\$334.02	168.8%	\$25.00
\$26.00	\$256.32	129.5%	\$284.26	143.6%	\$346.54	175.1%	\$26.00
\$27.00	\$268.83	135.8%	\$296.77	149.9%	\$359.05	181.4%	\$27.00
\$28.00	\$281.34	142.1%	\$309.28	156.3%	\$371.56	187.7%	\$28.00
\$29.00	\$293.85	148.5%	\$321.80	162.6%	\$384.07	194.0%	\$29.00
\$30.00	\$306.37	154.8%	\$334.31	168.9%	\$396.58	200.4%	\$30.00
\$31.00	\$318.88	161.1%	\$346.82	175.2%	\$409.10	206.7%	\$31.00
\$32.00	\$331.39	167.4%	\$359.33	181.5%	\$421.61	213.0%	\$32.00
\$33.00	\$343.90	173.7%	\$371.84	187.9%	\$434.12	219.3%	\$33.00
\$34.00	\$356.41	180.1%	\$384.36	194.2%	\$446.63	225.6%	\$34.00
\$35.00	\$368.93	186.4%	\$396.87	200.5%	\$459.14	232.0%	\$35.00
\$36.00	\$381.44	192.7%	\$409.38	206.8%	\$471.66	238.3%	\$36.00
\$37.00	\$393.95	199.0%	\$421.89	213.1%	\$484.17	244.6%	\$37.00
\$38.00	\$406.46	205.3%	\$434.40	219.5%	\$496.68	250.9%	\$38.00
\$39.00	\$418.97	211.7%	\$446.92	225.8%	\$509.19	257.2%	\$39.00
\$40.00	\$431.49	218.0%	\$459.43	232.1%	\$521.70	263.6%	\$40.00
\$41.00	\$444.00	224.3%	\$471.94	238.4%	\$534.22	269.9%	\$41.00
\$42.00	\$456.51	230.6%	\$484.45	244.8%	\$546.73	276.2%	\$42.00
\$43.00	\$469.02	237.0%	\$496.96	251.1%	\$559.24	282.5%	\$43.00
\$44.00	\$481.53	243.3%	\$509.48	257.4%	\$571.75	288.9%	\$44.00
\$45.00	\$494.05	249.6%	\$521.99	263.7%	\$584.26	295.2%	\$45.00

Table indicating for workstation Type 6 - Trading Desk the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**15-inch FPM
Workstation Type 7 - Medium Cubicle**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$41.68	84.2%	\$59.78	120.8%	\$128.40	259.5%	\$5.00
\$6.00	\$49.79	100.6%	\$67.89	137.2%	\$136.51	275.9%	\$6.00
\$7.00	\$57.89	117.0%	\$76.00	153.6%	\$144.62	292.2%	\$7.00
\$8.00	\$66.00	133.4%	\$84.11	170.0%	\$152.72	308.6%	\$8.00
\$9.00	\$74.11	149.8%	\$92.21	186.4%	\$160.83	325.0%	\$9.00
\$10.00	\$82.22	166.1%	\$100.32	202.7%	\$168.94	341.4%	\$10.00
\$11.00	\$90.32	182.5%	\$108.43	219.1%	\$177.05	357.8%	\$11.00
\$12.00	\$98.43	198.9%	\$116.54	235.5%	\$185.15	374.2%	\$12.00
\$13.00	\$106.54	215.3%	\$124.64	251.9%	\$193.26	390.5%	\$13.00
\$14.00	\$114.65	231.7%	\$132.75	268.3%	\$201.37	406.9%	\$14.00
\$15.00	\$122.75	248.1%	\$140.86	284.7%	\$209.48	423.3%	\$15.00
\$16.00	\$130.86	264.5%	\$148.97	301.0%	\$217.58	439.7%	\$16.00
\$17.00	\$138.97	280.8%	\$157.07	317.4%	\$225.69	456.1%	\$17.00
\$18.00	\$147.08	297.2%	\$165.18	333.8%	\$233.80	472.5%	\$18.00
\$19.00	\$155.18	313.6%	\$173.29	350.2%	\$241.91	488.9%	\$19.00
\$20.00	\$163.29	330.0%	\$181.40	366.6%	\$250.01	505.2%	\$20.00
\$21.00	\$171.40	346.4%	\$189.50	383.0%	\$258.12	521.6%	\$21.00
\$22.00	\$179.51	362.8%	\$197.61	399.3%	\$266.23	538.0%	\$22.00
\$23.00	\$187.61	379.1%	\$205.72	415.7%	\$274.34	554.4%	\$23.00
\$24.00	\$195.72	395.5%	\$213.83	432.1%	\$282.44	570.8%	\$24.00
\$25.00	\$203.83	411.9%	\$221.93	448.5%	\$290.55	587.2%	\$25.00
\$26.00	\$211.94	428.3%	\$230.04	464.9%	\$298.66	603.5%	\$26.00
\$27.00	\$220.04	444.7%	\$238.15	481.3%	\$306.77	619.9%	\$27.00
\$28.00	\$228.15	461.1%	\$246.26	497.6%	\$314.87	636.3%	\$28.00
\$29.00	\$236.26	477.4%	\$254.36	514.0%	\$322.98	652.7%	\$29.00
\$30.00	\$244.37	493.8%	\$262.47	530.4%	\$331.09	669.1%	\$30.00
\$31.00	\$252.47	510.2%	\$270.58	546.8%	\$339.20	685.5%	\$31.00
\$32.00	\$260.58	526.6%	\$278.69	563.2%	\$347.30	701.8%	\$32.00
\$33.00	\$268.69	543.0%	\$286.79	579.6%	\$355.41	718.2%	\$33.00
\$34.00	\$276.80	559.4%	\$294.90	596.0%	\$363.52	734.6%	\$34.00
\$35.00	\$284.90	575.7%	\$303.01	612.3%	\$371.63	751.0%	\$35.00
\$36.00	\$293.01	592.1%	\$311.12	628.7%	\$379.73	767.4%	\$36.00
\$37.00	\$301.12	608.5%	\$319.22	645.1%	\$387.84	783.8%	\$37.00
\$38.00	\$309.23	624.9%	\$327.33	661.5%	\$395.95	800.1%	\$38.00
\$39.00	\$317.33	641.3%	\$335.44	677.9%	\$404.06	816.5%	\$39.00
\$40.00	\$325.44	657.7%	\$343.55	694.3%	\$412.16	832.9%	\$40.00
\$41.00	\$333.55	674.1%	\$351.65	710.6%	\$420.27	849.3%	\$41.00
\$42.00	\$341.66	690.4%	\$359.76	727.0%	\$428.38	865.7%	\$42.00
\$43.00	\$349.76	706.8%	\$367.87	743.4%	\$436.49	882.1%	\$43.00
\$44.00	\$357.87	723.2%	\$375.98	759.8%	\$444.59	898.5%	\$44.00
\$45.00	\$365.98	739.6%	\$384.08	776.2%	\$452.70	914.8%	\$45.00

Table indicating for workstation Type 7 - Medium Desk the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**17-inch FPM
Workstation Type 1 - Training Room**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	-\$8.27	-11.6%	\$2.26	3.2%	\$33.55	47.2%	\$5.00
\$6.00	-\$3.56	-5.0%	\$6.97	9.8%	\$38.27	53.9%	\$6.00
\$7.00	\$1.16	1.6%	\$11.69	16.4%	\$42.98	60.5%	\$7.00
\$8.00	\$5.87	8.3%	\$16.40	23.1%	\$47.70	67.1%	\$8.00
\$9.00	\$10.59	14.9%	\$21.12	29.7%	\$52.41	73.8%	\$9.00
\$10.00	\$15.30	21.5%	\$25.83	36.4%	\$57.13	80.4%	\$10.00
\$11.00	\$20.02	28.2%	\$30.55	43.0%	\$61.84	87.0%	\$11.00
\$12.00	\$24.73	34.8%	\$35.26	49.6%	\$66.56	93.7%	\$12.00
\$13.00	\$29.45	41.4%	\$39.98	56.3%	\$71.27	100.3%	\$13.00
\$14.00	\$34.16	48.1%	\$44.69	62.9%	\$75.99	106.9%	\$14.00
\$15.00	\$38.88	54.7%	\$49.41	69.5%	\$80.70	113.6%	\$15.00
\$16.00	\$43.59	61.4%	\$54.12	76.2%	\$85.42	120.2%	\$16.00
\$17.00	\$48.31	68.0%	\$58.84	82.8%	\$90.13	126.8%	\$17.00
\$18.00	\$53.02	74.6%	\$63.55	89.4%	\$94.85	133.5%	\$18.00
\$19.00	\$57.74	81.3%	\$68.27	96.1%	\$99.56	140.1%	\$19.00
\$20.00	\$62.45	87.9%	\$72.98	102.7%	\$104.28	146.8%	\$20.00
\$21.00	\$67.17	94.5%	\$77.70	109.3%	\$108.99	153.4%	\$21.00
\$22.00	\$71.88	101.2%	\$82.41	116.0%	\$113.71	160.0%	\$22.00
\$23.00	\$76.60	107.8%	\$87.13	122.6%	\$118.42	166.7%	\$23.00
\$24.00	\$81.31	114.4%	\$91.84	129.3%	\$123.14	173.3%	\$24.00
\$25.00	\$86.03	121.1%	\$96.56	135.9%	\$127.85	179.9%	\$25.00
\$26.00	\$90.74	127.7%	\$101.27	142.5%	\$132.57	186.6%	\$26.00
\$27.00	\$95.46	134.3%	\$105.99	149.2%	\$137.28	193.2%	\$27.00
\$28.00	\$100.17	141.0%	\$110.70	155.8%	\$142.00	199.8%	\$28.00
\$29.00	\$104.89	147.6%	\$115.42	162.4%	\$146.71	206.5%	\$29.00
\$30.00	\$109.60	154.3%	\$120.13	169.1%	\$151.43	213.1%	\$30.00
\$31.00	\$114.32	160.9%	\$124.85	175.7%	\$156.14	219.7%	\$31.00
\$32.00	\$119.03	167.5%	\$129.56	182.3%	\$160.86	226.4%	\$32.00
\$33.00	\$123.75	174.2%	\$134.28	189.0%	\$165.57	233.0%	\$33.00
\$34.00	\$128.46	180.8%	\$138.99	195.6%	\$170.29	239.7%	\$34.00
\$35.00	\$133.18	187.4%	\$143.71	202.2%	\$175.00	246.3%	\$35.00
\$36.00	\$137.89	194.1%	\$148.42	208.9%	\$179.72	252.9%	\$36.00
\$37.00	\$142.61	200.7%	\$153.14	215.5%	\$184.43	259.6%	\$37.00
\$38.00	\$147.32	207.3%	\$157.85	222.2%	\$189.15	266.2%	\$38.00
\$39.00	\$152.04	214.0%	\$162.57	228.8%	\$193.86	272.8%	\$39.00
\$40.00	\$156.75	220.6%	\$167.28	235.4%	\$198.58	279.5%	\$40.00
\$41.00	\$161.47	227.2%	\$172.00	242.1%	\$203.29	286.1%	\$41.00
\$42.00	\$166.18	233.9%	\$176.71	248.7%	\$208.01	292.7%	\$42.00
\$43.00	\$170.90	240.5%	\$181.43	255.3%	\$212.72	299.4%	\$43.00
\$44.00	\$175.61	247.2%	\$186.14	262.0%	\$217.44	306.0%	\$44.00
\$45.00	\$180.33	253.8%	\$190.86	268.6%	\$222.15	312.6%	\$45.00

Table indicating for workstation Type 1 - Training Room the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**17-inch FPM
Workstation Type 2 - Carrel**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$28.17	39.6%	\$40.24	56.6%	\$74.29	104.5%	\$5.00
\$6.00	\$33.57	47.2%	\$45.64	64.2%	\$79.69	112.2%	\$6.00
\$7.00	\$38.98	54.9%	\$51.05	71.8%	\$85.10	119.8%	\$7.00
\$8.00	\$44.38	62.5%	\$56.45	79.4%	\$90.50	127.4%	\$8.00
\$9.00	\$49.79	70.1%	\$61.86	87.1%	\$95.91	135.0%	\$9.00
\$10.00	\$55.19	77.7%	\$67.26	94.7%	\$101.31	142.6%	\$10.00
\$11.00	\$60.60	85.3%	\$72.67	102.3%	\$106.72	150.2%	\$11.00
\$12.00	\$66.00	92.9%	\$78.07	109.9%	\$112.12	157.8%	\$12.00
\$13.00	\$71.41	100.5%	\$83.48	117.5%	\$117.53	165.4%	\$13.00
\$14.00	\$76.81	108.1%	\$88.88	125.1%	\$122.93	173.0%	\$14.00
\$15.00	\$82.22	115.7%	\$94.29	132.7%	\$128.34	180.6%	\$15.00
\$16.00	\$87.62	123.3%	\$99.69	140.3%	\$133.74	188.2%	\$16.00
\$17.00	\$93.03	130.9%	\$105.10	147.9%	\$139.15	195.8%	\$17.00
\$18.00	\$98.43	138.5%	\$110.50	155.5%	\$144.55	203.4%	\$18.00
\$19.00	\$103.84	146.1%	\$115.91	163.1%	\$149.96	211.0%	\$19.00
\$20.00	\$109.24	153.7%	\$121.31	170.7%	\$155.36	218.7%	\$20.00
\$21.00	\$114.65	161.4%	\$126.72	178.3%	\$160.77	226.3%	\$21.00
\$22.00	\$120.05	169.0%	\$132.12	185.9%	\$166.17	233.9%	\$22.00
\$23.00	\$125.46	176.6%	\$137.53	193.6%	\$171.58	241.5%	\$23.00
\$24.00	\$130.86	184.2%	\$142.93	201.2%	\$176.98	249.1%	\$24.00
\$25.00	\$136.27	191.8%	\$148.34	208.8%	\$182.39	256.7%	\$25.00
\$26.00	\$141.67	199.4%	\$153.74	216.4%	\$187.79	264.3%	\$26.00
\$27.00	\$147.08	207.0%	\$159.15	224.0%	\$193.20	271.9%	\$27.00
\$28.00	\$152.48	214.6%	\$164.55	231.6%	\$198.60	279.5%	\$28.00
\$29.00	\$157.89	222.2%	\$169.96	239.2%	\$204.01	287.1%	\$29.00
\$30.00	\$163.29	229.8%	\$175.36	246.8%	\$209.41	294.7%	\$30.00
\$31.00	\$168.70	237.4%	\$180.77	254.4%	\$214.82	302.3%	\$31.00
\$32.00	\$174.10	245.0%	\$186.17	262.0%	\$220.22	309.9%	\$32.00
\$33.00	\$179.51	252.6%	\$191.58	269.6%	\$225.63	317.5%	\$33.00
\$34.00	\$184.91	260.2%	\$196.98	277.2%	\$231.03	325.1%	\$34.00
\$35.00	\$190.32	267.8%	\$202.39	284.8%	\$236.44	332.8%	\$35.00
\$36.00	\$195.72	275.5%	\$207.79	292.4%	\$241.84	340.4%	\$36.00
\$37.00	\$201.13	283.1%	\$213.20	300.0%	\$247.25	348.0%	\$37.00
\$38.00	\$206.53	290.7%	\$218.60	307.7%	\$252.65	355.6%	\$38.00
\$39.00	\$211.94	298.3%	\$224.01	315.3%	\$258.06	363.2%	\$39.00
\$40.00	\$217.34	305.9%	\$229.41	322.9%	\$263.46	370.8%	\$40.00
\$41.00	\$222.75	313.5%	\$234.82	330.5%	\$268.87	378.4%	\$41.00
\$42.00	\$228.15	321.1%	\$240.22	338.1%	\$274.27	386.0%	\$42.00
\$43.00	\$233.56	328.7%	\$245.63	345.7%	\$279.68	393.6%	\$43.00
\$44.00	\$238.96	336.3%	\$251.03	353.3%	\$285.08	401.2%	\$44.00
\$45.00	\$244.37	343.9%	\$256.44	360.9%	\$290.49	408.8%	\$45.00

Table indicating for workstation Type 2 - Carrel the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**17-inch FPM
Workstation Type 3 - Hub and Spoke**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	-\$5.79	-8.2%	\$4.71	6.6%	\$52.87	74.4%	\$5.00
\$6.00	-\$1.09	-1.5%	\$9.41	13.3%	\$57.57	81.0%	\$6.00
\$7.00	\$3.61	5.1%	\$14.12	19.9%	\$62.27	87.6%	\$7.00
\$8.00	\$8.32	11.7%	\$18.82	26.5%	\$66.98	94.3%	\$8.00
\$9.00	\$13.02	18.3%	\$23.53	33.1%	\$71.68	100.9%	\$9.00
\$10.00	\$17.73	24.9%	\$28.23	39.7%	\$76.38	107.5%	\$10.00
\$11.00	\$22.43	31.6%	\$32.93	46.3%	\$81.09	114.1%	\$11.00
\$12.00	\$27.13	38.2%	\$37.64	53.0%	\$85.79	120.7%	\$12.00
\$13.00	\$31.84	44.8%	\$42.34	59.6%	\$90.49	127.4%	\$13.00
\$14.00	\$36.54	51.4%	\$47.04	66.2%	\$95.20	134.0%	\$14.00
\$15.00	\$41.24	58.0%	\$51.75	72.8%	\$99.90	140.6%	\$15.00
\$16.00	\$45.95	64.7%	\$56.45	79.4%	\$104.60	147.2%	\$16.00
\$17.00	\$50.65	71.3%	\$61.15	86.1%	\$109.31	153.8%	\$17.00
\$18.00	\$55.35	77.9%	\$65.86	92.7%	\$114.01	160.5%	\$18.00
\$19.00	\$60.06	84.5%	\$70.56	99.3%	\$118.71	167.1%	\$19.00
\$20.00	\$64.76	91.1%	\$75.26	105.9%	\$123.42	173.7%	\$20.00
\$21.00	\$69.46	97.8%	\$79.97	112.5%	\$128.12	180.3%	\$21.00
\$22.00	\$74.17	104.4%	\$84.67	119.2%	\$132.83	186.9%	\$22.00
\$23.00	\$78.87	111.0%	\$89.37	125.8%	\$137.53	193.6%	\$23.00
\$24.00	\$83.57	117.6%	\$94.08	132.4%	\$142.23	200.2%	\$24.00
\$25.00	\$88.28	124.2%	\$98.78	139.0%	\$146.94	206.8%	\$25.00
\$26.00	\$92.98	130.9%	\$103.48	145.6%	\$151.64	213.4%	\$26.00
\$27.00	\$97.68	137.5%	\$108.19	152.3%	\$156.34	220.0%	\$27.00
\$28.00	\$102.39	144.1%	\$112.89	158.9%	\$161.05	226.7%	\$28.00
\$29.00	\$107.09	150.7%	\$117.60	165.5%	\$165.75	233.3%	\$29.00
\$30.00	\$111.80	157.3%	\$122.30	172.1%	\$170.45	239.9%	\$30.00
\$31.00	\$116.50	164.0%	\$127.00	178.7%	\$175.16	246.5%	\$31.00
\$32.00	\$121.20	170.6%	\$131.71	185.4%	\$179.86	253.1%	\$32.00
\$33.00	\$125.91	177.2%	\$136.41	192.0%	\$184.56	259.7%	\$33.00
\$34.00	\$130.61	183.8%	\$141.11	198.6%	\$189.27	266.4%	\$34.00
\$35.00	\$135.31	190.4%	\$145.82	205.2%	\$193.97	273.0%	\$35.00
\$36.00	\$140.02	197.1%	\$150.52	211.8%	\$198.67	279.6%	\$36.00
\$37.00	\$144.72	203.7%	\$155.22	218.5%	\$203.38	286.2%	\$37.00
\$38.00	\$149.42	210.3%	\$159.93	225.1%	\$208.08	292.8%	\$38.00
\$39.00	\$154.13	216.9%	\$164.63	231.7%	\$212.78	299.5%	\$39.00
\$40.00	\$158.83	223.5%	\$169.33	238.3%	\$217.49	306.1%	\$40.00
\$41.00	\$163.53	230.2%	\$174.04	244.9%	\$222.19	312.7%	\$41.00
\$42.00	\$168.24	236.8%	\$178.74	251.6%	\$226.90	319.3%	\$42.00
\$43.00	\$172.94	243.4%	\$183.44	258.2%	\$231.60	325.9%	\$43.00
\$44.00	\$177.64	250.0%	\$188.15	264.8%	\$236.30	332.6%	\$44.00
\$45.00	\$182.35	256.6%	\$192.85	271.4%	\$241.01	339.2%	\$45.00

Table indicating for workstation Type 3 - Hub and Spoke the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**17-inch FPM
Workstation Type 4 - Sawtooth**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$26.19	36.9%	\$40.21	56.6%	\$97.83	131.5%	\$5.00
\$6.00	\$32.47	45.7%	\$46.49	65.4%	\$104.11	139.1%	\$6.00
\$7.00	\$38.75	54.5%	\$52.77	74.3%	\$110.39	146.8%	\$7.00
\$8.00	\$45.03	63.4%	\$59.05	83.1%	\$116.67	154.4%	\$8.00
\$9.00	\$51.31	72.2%	\$65.33	91.9%	\$122.95	162.0%	\$9.00
\$10.00	\$57.59	81.0%	\$71.61	100.8%	\$129.23	169.6%	\$10.00
\$11.00	\$63.87	89.9%	\$77.89	109.6%	\$135.51	177.2%	\$11.00
\$12.00	\$70.15	98.7%	\$84.17	118.5%	\$141.79	184.8%	\$12.00
\$13.00	\$76.43	107.6%	\$90.45	127.3%	\$148.07	192.4%	\$13.00
\$14.00	\$82.70	116.4%	\$96.73	136.1%	\$154.35	200.0%	\$14.00
\$15.00	\$88.98	125.2%	\$103.00	145.0%	\$160.62	207.6%	\$15.00
\$16.00	\$95.26	134.1%	\$109.28	153.8%	\$166.90	215.2%	\$16.00
\$17.00	\$101.54	142.9%	\$115.56	162.6%	\$173.18	222.8%	\$17.00
\$18.00	\$107.82	151.7%	\$121.84	171.5%	\$179.46	230.4%	\$18.00
\$19.00	\$114.10	160.6%	\$128.12	180.3%	\$185.74	238.0%	\$19.00
\$20.00	\$120.38	169.4%	\$134.40	189.2%	\$192.02	245.6%	\$20.00
\$21.00	\$126.66	178.3%	\$140.68	198.0%	\$198.30	253.2%	\$21.00
\$22.00	\$132.94	187.1%	\$146.96	206.8%	\$204.58	260.9%	\$22.00
\$23.00	\$139.22	195.9%	\$153.24	215.7%	\$210.86	268.5%	\$23.00
\$24.00	\$145.49	204.8%	\$159.52	224.5%	\$217.14	276.1%	\$24.00
\$25.00	\$151.77	213.6%	\$165.79	233.3%	\$223.41	283.7%	\$25.00
\$26.00	\$158.05	222.4%	\$172.07	242.2%	\$229.69	291.3%	\$26.00
\$27.00	\$164.33	231.3%	\$178.35	251.0%	\$235.97	298.9%	\$27.00
\$28.00	\$170.61	240.1%	\$184.63	259.8%	\$242.25	306.5%	\$28.00
\$29.00	\$176.89	248.9%	\$190.91	268.7%	\$248.53	314.1%	\$29.00
\$30.00	\$183.17	257.8%	\$197.19	277.5%	\$254.81	321.7%	\$30.00
\$31.00	\$189.45	266.6%	\$203.47	286.4%	\$261.09	329.3%	\$31.00
\$32.00	\$195.73	275.5%	\$209.75	295.2%	\$267.37	336.9%	\$32.00
\$33.00	\$202.01	284.3%	\$216.03	304.0%	\$273.65	344.5%	\$33.00
\$34.00	\$208.28	293.1%	\$222.31	312.9%	\$279.93	352.1%	\$34.00
\$35.00	\$214.56	302.0%	\$228.58	321.7%	\$286.20	359.7%	\$35.00
\$36.00	\$220.84	310.8%	\$234.86	330.5%	\$292.48	367.4%	\$36.00
\$37.00	\$227.12	319.6%	\$241.14	339.4%	\$298.76	375.0%	\$37.00
\$38.00	\$233.40	328.5%	\$247.42	348.2%	\$305.04	382.6%	\$38.00
\$39.00	\$239.68	337.3%	\$253.70	357.1%	\$311.32	390.2%	\$39.00
\$40.00	\$245.96	346.2%	\$259.98	365.9%	\$317.60	397.8%	\$40.00
\$41.00	\$252.24	355.0%	\$266.26	374.7%	\$323.88	405.4%	\$41.00
\$42.00	\$258.52	363.8%	\$272.54	383.6%	\$330.16	413.0%	\$42.00
\$43.00	\$264.80	372.7%	\$278.82	392.4%	\$336.44	420.6%	\$43.00
\$44.00	\$271.07	381.5%	\$285.10	401.2%	\$342.72	428.2%	\$44.00
\$45.00	\$277.35	390.3%	\$291.37	410.1%	\$348.99	435.8%	\$45.00

Table indicating for workstation Type 4 - Sawtooth the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
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Appendix B - Financial Results

**17-inch FPM
Workstation Type 5 - Small Cubicle**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$28.30	39.8%	\$46.66	65.7%	\$102.21	143.9%	\$5.00
\$6.00	\$36.52	51.4%	\$54.88	77.2%	\$110.44	155.4%	\$6.00
\$7.00	\$44.74	63.0%	\$63.10	88.8%	\$118.66	167.0%	\$7.00
\$8.00	\$52.97	74.5%	\$71.33	100.4%	\$126.88	178.6%	\$8.00
\$9.00	\$61.19	86.1%	\$79.55	112.0%	\$135.10	190.1%	\$9.00
\$10.00	\$69.41	97.7%	\$87.77	123.5%	\$143.33	201.7%	\$10.00
\$11.00	\$77.63	109.3%	\$95.99	135.1%	\$151.55	213.3%	\$11.00
\$12.00	\$85.86	120.8%	\$104.22	146.7%	\$159.77	224.9%	\$12.00
\$13.00	\$94.08	132.4%	\$112.44	158.2%	\$167.99	236.4%	\$13.00
\$14.00	\$102.30	144.0%	\$120.66	169.8%	\$176.22	248.0%	\$14.00
\$15.00	\$110.52	155.5%	\$128.88	181.4%	\$184.44	259.6%	\$15.00
\$16.00	\$118.75	167.1%	\$137.11	193.0%	\$192.66	271.1%	\$16.00
\$17.00	\$126.97	178.7%	\$145.33	204.5%	\$200.88	282.7%	\$17.00
\$18.00	\$135.19	190.3%	\$153.55	216.1%	\$209.11	294.3%	\$18.00
\$19.00	\$143.41	201.8%	\$161.77	227.7%	\$217.33	305.9%	\$19.00
\$20.00	\$151.64	213.4%	\$170.00	239.2%	\$225.55	317.4%	\$20.00
\$21.00	\$159.86	225.0%	\$178.22	250.8%	\$233.77	329.0%	\$21.00
\$22.00	\$168.08	236.6%	\$186.44	262.4%	\$242.00	340.6%	\$22.00
\$23.00	\$176.30	248.1%	\$194.66	274.0%	\$250.22	352.1%	\$23.00
\$24.00	\$184.53	259.7%	\$202.89	285.5%	\$258.44	363.7%	\$24.00
\$25.00	\$192.75	271.3%	\$211.11	297.1%	\$266.66	375.3%	\$25.00
\$26.00	\$200.97	282.8%	\$219.33	308.7%	\$274.89	386.9%	\$26.00
\$27.00	\$209.19	294.4%	\$227.55	320.3%	\$283.11	398.4%	\$27.00
\$28.00	\$217.42	306.0%	\$235.78	331.8%	\$291.33	410.0%	\$28.00
\$29.00	\$225.64	317.6%	\$244.00	343.4%	\$299.55	421.6%	\$29.00
\$30.00	\$233.86	329.1%	\$252.22	355.0%	\$307.78	433.2%	\$30.00
\$31.00	\$242.08	340.7%	\$260.44	366.5%	\$316.00	444.7%	\$31.00
\$32.00	\$250.31	352.3%	\$268.67	378.1%	\$324.22	456.3%	\$32.00
\$33.00	\$258.53	363.8%	\$276.89	389.7%	\$332.44	467.9%	\$33.00
\$34.00	\$266.75	375.4%	\$285.11	401.3%	\$340.67	479.4%	\$34.00
\$35.00	\$274.97	387.0%	\$293.33	412.8%	\$348.89	491.0%	\$35.00
\$36.00	\$283.20	398.6%	\$301.56	424.4%	\$357.11	502.6%	\$36.00
\$37.00	\$291.42	410.1%	\$309.78	436.0%	\$365.33	514.2%	\$37.00
\$38.00	\$299.64	421.7%	\$318.00	447.5%	\$373.56	525.7%	\$38.00
\$39.00	\$307.86	433.3%	\$326.22	459.1%	\$381.78	537.3%	\$39.00
\$40.00	\$316.09	444.8%	\$334.45	470.7%	\$390.00	548.9%	\$40.00
\$41.00	\$324.31	456.4%	\$342.67	482.3%	\$398.22	560.4%	\$41.00
\$42.00	\$332.53	468.0%	\$350.89	493.8%	\$406.45	572.0%	\$42.00
\$43.00	\$340.75	479.6%	\$359.11	505.4%	\$414.67	583.6%	\$43.00
\$44.00	\$348.98	491.1%	\$367.34	517.0%	\$422.89	595.2%	\$44.00
\$45.00	\$357.20	502.7%	\$375.56	528.6%	\$431.11	606.7%	\$45.00

Table indicating for workstation Type 5 - Small Cubicle the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.



**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**17-inch FPM
Workstation Type 6 - Trading Desk**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	-\$92.71	-32.6%	-\$64.77	-22.8%	-\$2.50	-0.9%	\$5.00
\$6.00	-\$80.20	-28.2%	-\$52.26	-18.4%	\$10.01	3.5%	\$6.00
\$7.00	-\$67.69	-23.8%	-\$39.75	-14.0%	\$22.53	7.9%	\$7.00
\$8.00	-\$55.18	-19.4%	-\$27.24	-9.6%	\$35.04	12.3%	\$8.00
\$9.00	-\$42.67	-15.0%	-\$14.72	-5.2%	\$47.55	16.7%	\$9.00
\$10.00	-\$30.15	-10.6%	-\$2.21	-0.8%	\$60.06	21.1%	\$10.00
\$11.00	-\$17.64	-6.2%	\$10.30	3.6%	\$72.57	25.5%	\$11.00
\$12.00	-\$5.13	-1.8%	\$22.81	8.0%	\$85.09	29.9%	\$12.00
\$13.00	\$7.38	2.6%	\$35.32	12.4%	\$97.60	34.3%	\$13.00
\$14.00	\$19.89	7.0%	\$47.84	16.8%	\$110.11	38.7%	\$14.00
\$15.00	\$32.41	11.4%	\$60.35	21.2%	\$122.62	43.1%	\$15.00
\$16.00	\$44.92	15.8%	\$72.86	25.6%	\$135.13	47.5%	\$16.00
\$17.00	\$57.43	20.2%	\$85.37	30.0%	\$147.65	51.9%	\$17.00
\$18.00	\$69.94	24.6%	\$97.88	34.4%	\$160.16	56.4%	\$18.00
\$19.00	\$82.45	29.0%	\$110.40	38.8%	\$172.67	60.8%	\$19.00
\$20.00	\$94.97	33.4%	\$122.91	43.2%	\$185.18	65.2%	\$20.00
\$21.00	\$107.48	37.8%	\$135.42	47.6%	\$197.69	69.6%	\$21.00
\$22.00	\$119.99	42.2%	\$147.93	52.0%	\$210.21	74.0%	\$22.00
\$23.00	\$132.50	46.6%	\$160.44	56.5%	\$222.72	78.4%	\$23.00
\$24.00	\$145.01	51.0%	\$172.96	60.9%	\$235.23	82.8%	\$24.00
\$25.00	\$157.53	55.4%	\$185.47	65.3%	\$247.74	87.2%	\$25.00
\$26.00	\$170.04	59.8%	\$197.98	69.7%	\$260.25	91.6%	\$26.00
\$27.00	\$182.55	64.2%	\$210.49	74.1%	\$272.77	96.0%	\$27.00
\$28.00	\$195.06	68.6%	\$223.00	78.5%	\$285.28	100.4%	\$28.00
\$29.00	\$207.57	73.0%	\$235.52	82.9%	\$297.79	104.8%	\$29.00
\$30.00	\$220.09	77.4%	\$248.03	87.3%	\$310.30	109.2%	\$30.00
\$31.00	\$232.60	81.8%	\$260.54	91.7%	\$322.81	113.6%	\$31.00
\$32.00	\$245.11	86.2%	\$273.05	96.1%	\$335.33	118.0%	\$32.00
\$33.00	\$257.62	90.6%	\$285.56	100.5%	\$347.84	122.4%	\$33.00
\$34.00	\$270.13	95.0%	\$298.08	104.9%	\$360.35	126.8%	\$34.00
\$35.00	\$282.65	99.4%	\$310.59	109.3%	\$372.86	131.2%	\$35.00
\$36.00	\$295.16	103.8%	\$323.10	113.7%	\$385.37	135.6%	\$36.00
\$37.00	\$307.67	108.3%	\$335.61	118.1%	\$397.89	140.0%	\$37.00
\$38.00	\$320.18	112.7%	\$348.12	122.5%	\$410.40	144.4%	\$38.00
\$39.00	\$332.69	117.1%	\$360.64	126.9%	\$422.91	148.8%	\$39.00
\$40.00	\$345.21	121.5%	\$373.15	131.3%	\$435.42	153.2%	\$40.00
\$41.00	\$357.72	125.9%	\$385.66	135.7%	\$447.93	157.6%	\$41.00
\$42.00	\$370.23	130.3%	\$398.17	140.1%	\$460.45	162.0%	\$42.00
\$43.00	\$382.74	134.7%	\$410.68	144.5%	\$472.96	166.4%	\$43.00
\$44.00	\$395.25	139.1%	\$423.20	148.9%	\$485.47	170.8%	\$44.00
\$45.00	\$407.77	143.5%	\$435.71	153.3%	\$497.98	175.2%	\$45.00

Table indicating for workstation Type 6 - Trading Desk the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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**Analysis of Facility Cost Savings
Associated with Flat Panel Monitors**

Appendix B - Financial Results

**17-inch FPM
Workstation Type 7 - Medium Cubicle**

Assumed Gross Rent (RSF)	Scenario A (Rent, Energy & Furniture)		Scenario B (Rent, Energy, Furniture, & Tenant Fit-Out)		Scenario C (Rent, Energy, Furniture, Tenant Fit-Out, & Base Bldg M/E)		Assumed Gross Rent (RSF)
	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	Savings per Wrkstn per Year	Return on Investment	
\$5.00	\$20.11	28.3%	\$38.21	53.8%	\$106.83	150.3%	\$5.00
\$6.00	\$28.22	39.7%	\$46.32	65.2%	\$114.94	161.8%	\$6.00
\$7.00	\$36.32	51.1%	\$54.43	76.6%	\$123.05	173.2%	\$7.00
\$8.00	\$44.43	62.5%	\$62.54	88.0%	\$131.15	184.6%	\$8.00
\$9.00	\$52.54	73.9%	\$70.64	99.4%	\$139.26	196.0%	\$9.00
\$10.00	\$60.65	85.4%	\$78.75	110.8%	\$147.37	207.4%	\$10.00
\$11.00	\$68.75	96.8%	\$86.86	122.2%	\$155.48	218.8%	\$11.00
\$12.00	\$76.86	108.2%	\$94.97	133.7%	\$163.58	230.2%	\$12.00
\$13.00	\$84.97	119.6%	\$103.07	145.1%	\$171.69	241.6%	\$13.00
\$14.00	\$93.08	131.0%	\$111.18	156.5%	\$179.80	253.0%	\$14.00
\$15.00	\$101.18	142.4%	\$119.29	167.9%	\$187.91	264.5%	\$15.00
\$16.00	\$109.29	153.8%	\$127.40	179.3%	\$196.01	275.9%	\$16.00
\$17.00	\$117.40	165.2%	\$135.50	190.7%	\$204.12	287.3%	\$17.00
\$18.00	\$125.51	176.6%	\$143.61	202.1%	\$212.23	298.7%	\$18.00
\$19.00	\$133.61	188.0%	\$151.72	213.5%	\$220.34	310.1%	\$19.00
\$20.00	\$141.72	199.5%	\$159.83	224.9%	\$228.44	321.5%	\$20.00
\$21.00	\$149.83	210.9%	\$167.93	236.3%	\$236.55	332.9%	\$21.00
\$22.00	\$157.94	222.3%	\$176.04	247.8%	\$244.66	344.3%	\$22.00
\$23.00	\$166.04	233.7%	\$184.15	259.2%	\$252.77	355.7%	\$23.00
\$24.00	\$174.15	245.1%	\$192.26	270.6%	\$260.87	367.1%	\$24.00
\$25.00	\$182.26	256.5%	\$200.36	282.0%	\$268.98	378.6%	\$25.00
\$26.00	\$190.37	267.9%	\$208.47	293.4%	\$277.09	390.0%	\$26.00
\$27.00	\$198.47	279.3%	\$216.58	304.8%	\$285.20	401.4%	\$27.00
\$28.00	\$206.58	290.7%	\$224.69	316.2%	\$293.30	412.8%	\$28.00
\$29.00	\$214.69	302.1%	\$232.79	327.6%	\$301.41	424.2%	\$29.00
\$30.00	\$222.80	313.6%	\$240.90	339.0%	\$309.52	435.6%	\$30.00
\$31.00	\$230.90	325.0%	\$249.01	350.4%	\$317.63	447.0%	\$31.00
\$32.00	\$239.01	336.4%	\$257.12	361.9%	\$325.73	458.4%	\$32.00
\$33.00	\$247.12	347.8%	\$265.22	373.3%	\$333.84	469.8%	\$33.00
\$34.00	\$255.23	359.2%	\$273.33	384.7%	\$341.95	481.2%	\$34.00
\$35.00	\$263.33	370.6%	\$281.44	396.1%	\$350.06	492.7%	\$35.00
\$36.00	\$271.44	382.0%	\$289.55	407.5%	\$358.16	504.1%	\$36.00
\$37.00	\$279.55	393.4%	\$297.65	418.9%	\$366.27	515.5%	\$37.00
\$38.00	\$287.66	404.8%	\$305.76	430.3%	\$374.38	526.9%	\$38.00
\$39.00	\$295.76	416.3%	\$313.87	441.7%	\$382.49	538.3%	\$39.00
\$40.00	\$303.87	427.7%	\$321.98	453.1%	\$390.59	549.7%	\$40.00
\$41.00	\$311.98	439.1%	\$330.08	464.6%	\$398.70	561.1%	\$41.00
\$42.00	\$320.09	450.5%	\$338.19	476.0%	\$406.81	572.5%	\$42.00
\$43.00	\$328.19	461.9%	\$346.30	487.4%	\$414.92	583.9%	\$43.00
\$44.00	\$336.30	473.3%	\$354.41	498.8%	\$423.02	595.4%	\$44.00
\$45.00	\$344.41	484.7%	\$362.51	510.2%	\$431.13	606.8%	\$45.00

Table indicating for workstation Type 7 - Medium Desk the savings per year, and the Return-On-Investment at various rental rates under the three Scenarios A, B, and C.

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