# Facility Assessment and Recommendation for Upgrades - Cuyahoga County Justice Center

## Facility Condition Assessment Report

**February 20, 2014**
**FINAL**

OSBORN ENGINEERING ROSSER K2M DESIGN

# ACKNOWLEDGEMENTS

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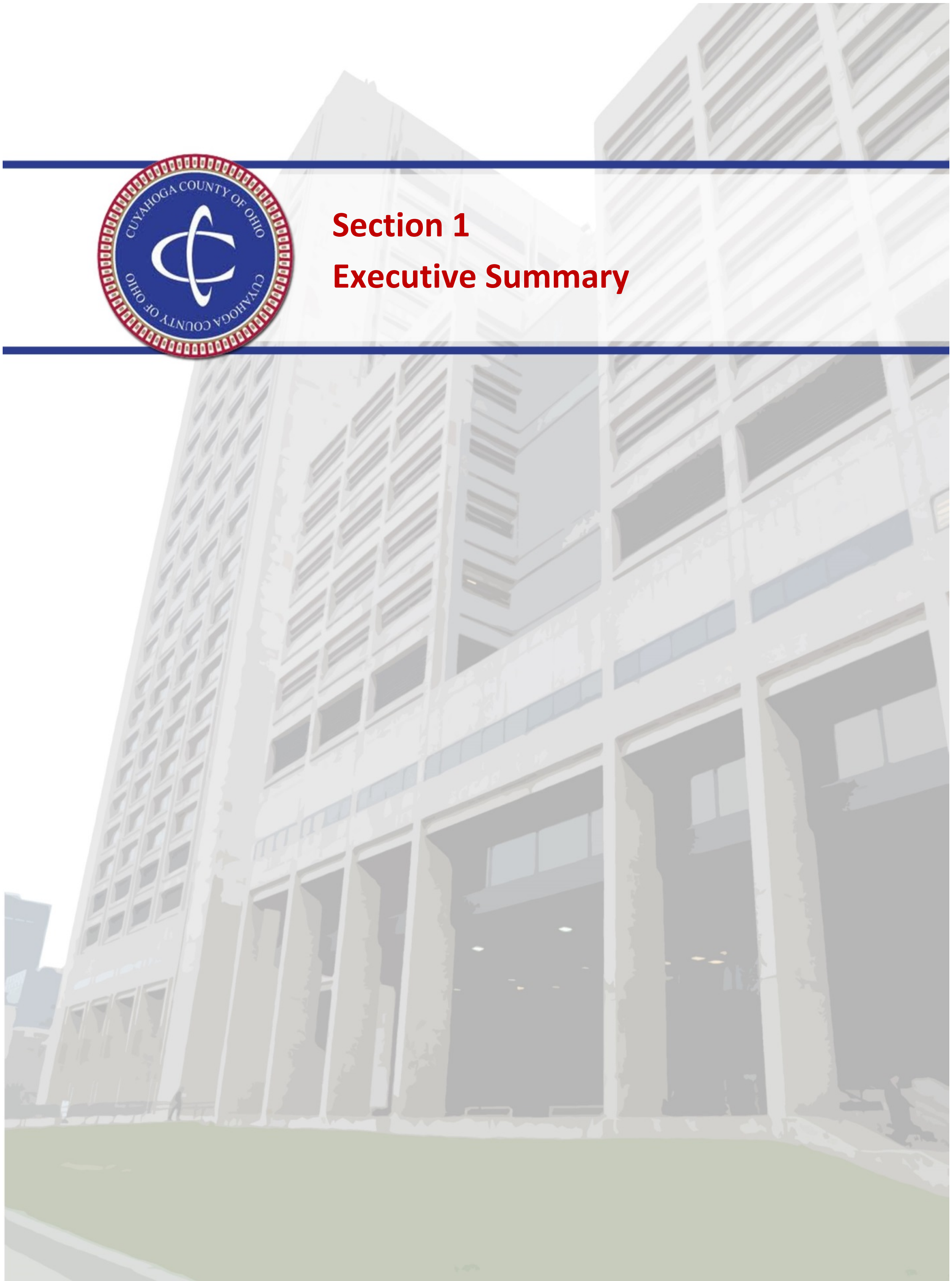
**APPENDICES:**



# Section 1
# Executive Summary

# 1. EXECUTIVE SUMMARY

## 1.1. Justice Complex Overview

The Cuyahoga County Justice Center Complex (CUYAHOGA COUNTY JUSTICE CENTER), first occupied in 1977, is a governmental compound located in downtown Cleveland, Ohio. The complex consists of the Cleveland Police Headquarters Building, the Cuyahoga County and Cleveland Municipal Courts Tower, and the Cuyahoga County Sheriff's Correction Center. The complex occupies a city block bound by Lakeside Avenue, Ontario Street, West 3rd Street, and St. Clair Avenue.

The Courts Tower was originally designed by Prindle, Patrick, and Partners and consists of a 26-story structure standing approximately 420 ft. tall, with court rooms and hearing rooms, divided between Cleveland Municipal and Cuyahoga County Common Pleas courts. Located south of Courts Tower is Cleveland's Police Headquarters Building. The Cleveland Police Headquarters Building, designed by Richard L. Bowen and Associates, serves the City's police department. West of the Courts Tower building is the Corrections Center (Jail I) and Jail II. Jail I was built in 1976 with a rated bed capacity of 956. Jail II, first occupied in November of 1994, has a rated bed capacity of 480, making the original combined rated bed capacity of both Jail I and Jail II at 1436.[1]

## 1.2. Assessment Overview

The County and City awarded the Osborn / K2M / Rosser team, through County Council of Cuyahoga County Ohio Resolution No. R2013-0097, the task to undertake a comprehensive facility conditions assessment and development of a comprehensive capital plan. The comprehensive analysis below develops a strategic plan for addressing the current building conditions, deficiencies, operations, technology, organizational structure between County and City, safety, security, and strives to enhance the Justice Center's functionality and physical performance.

Cuyahoga County and the City of Cleveland requested a professional assessment of the Cuyahoga County Justice Center Facility and the Police Building. The assessment project began in early 2013 and included a complete evaluation of the County and City's functional use and physical condition of the Justice Center Complex. Reviews included operations, physical layout, and building components. The assessment also includes recommendations for further sustainment and/or upgrades to ensure the facilities can continue to function effectively and efficiently. The objective of the facility assessment was to develop a comprehensive capital plan for recommended improvements enabling it to function more efficiently over the next 25+ years.

A comprehensive review of the existing conditions and procedures at the Justice Center Complex was performed for this assessment. The assessment included a facility conditions assessment performed by building specialists who evaluated the current building conditions, deficiencies, maintenance operations, technology, and security operations. Additional evaluations included sustainability, accessibility, life cycle cost, and vertical transportation.

[1] Excerpt taken from Wikipedia, the free encyclopedia.

Although routine maintenance and renovation projects have been performed over the years, the overall physical components of the Justice Center Complex are or will soon reach the end of their life. This is based on national, predictable construction materials life cycles for this region of the Country and their type use. As presented in this Report, the Assessment Team performed a comprehensive review of existing legacy data, observed each system within each building, documented the existing state, analyzed all data obtained, and is providing specific recommendations to extend the life of the facility another 25+ years. Given the nature of the 24/7 operations that occur in the Jail, Sheriff's Department, and Police Building, the County and City can expect an accelerated component life cycle given the heavy operational usage within those facilities.

At the highest level of analyzing the resulting data, table 1 below reflects the overall compiled Justice Center Complex Condition Index (CI). In this table, primary facility elements have been wrapped into major facility components. The condition index (CI) is used in facilities management to provide a benchmark for comparing the relative condition of a group of building components, overall capital assets, and any number of combinations. In addition, the CI is used to establish decision making policies.

$$\text{CI} = \frac{\text{Cost of Corrective Work and/or Component Renewals}}{\text{Overall Value of Facility or Component}}$$

Rough Order of Magnitude (ROM) Cost estimates were developed using RSMeans™ standard cost data, non-standard costs, and regional experience. Rough Order of Magnitude (ROM) asset values were established using building cost averages for this region and building types thereby establishing a baseline for component values.

As further explained in the facility condition assessment methodology below, cost estimates to repair or replace building components were established based on urgency and in correlation with the needs identified in the Planning Study. The below, high-level table provides multiple periods of priority (urgency) and the overall cost estimate for each major component in each of these time periods. Based on the Justice Center's ROM value of approximately $475 million and recommended capital expenditures estimated at approximately $236 million over the next 12 years, the CI for the compiled Justice Center complex is .50. In addition we have provided the CI for each of the major components to further clarify the specific areas requiring funding.

Interpreting the CI is only one of many means used to determine future capital planning. In this high level data review the CI can be interpreted as a snapshot percentage of the component's needs over the duration of the capital plan. The monetary interpretation has many layers to consider, including, the estimated 50% expenditure of current value over the next 12 years required to bring the complex to a renovated condition with like-kind materials. There are also considerations to upgrade components for reducing annual operating costs and/or weighing material types and layout to insure the facility fulfills future programming needs of the County and City.

*Table 1: Overall Compiled Justice Center High Level Condition Assessment Estimated 12-Year Capital Expenditures*

| COMPONENTS | ROM ESTIMATE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $10,336 | $0 | $0 | $10,336 | $0 | 0.00 |
| B- Shells | $48,738,297 | $8,476,185 | $21,912,466 | $3,674,230 | $14,675,416 | 0.33 |
| C- Interiors | $37,276,861 | $28,803 | $11,176,727 | $11,101,931 | $14,969,400 | 0.61 |
| D- Services | $126,612,876 | $2,354,527 | $55,739,388 | $35,690,179 | $32,828,783 | 0.69 |
| E- Equipment | $9,123,574 | $155,864 | $518,446 | $4,224,632 | $4,224,632 | 0.21 |
| Parking Garages | $14,641,083 | $0 | $9,807,654 | $4,688,726 | $144,703 | 0.50 |
| **Sub-Total** | **$236,403,027** | **$11,015,379** | **$99,154,682** | **$59,390,033** | **$66,842,933** | **0.50** |

As directed by the client the breakdown of facility level of responsibility between Cuyahoga County and the City of Cleveland is as follows[2]:

| Facility | County Responsibility | City Responsibility |
|---|---|---|
| Galleria/Atrium | 0.7035 | 0.2965 |
| Courts Tower | 0.7091 | 0.2929 |
| Jail I | 0.9845 | 0.0155 |
| Jail II | 1 | 0 |
| CMPH | 0 | 1 |

Based on the above table of values the 12-Year projected capital expenditures between the County and City are as follows:

*Table 2: Compiled Justice Center High Level Condition Assessment Estimated 12-Year Capital Expenditures for County*

| COUNTY | ROM ESTIMATE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $10,336 | $0 | $0 | $10,336 | $0 | 0.00 |
| B- Shells | $30,880,922 | $6,428,019 | $11,418,396 | $3,061,083 | $9,973,424 | 0.30 |
| C- Interiors | $23,286,175 | $20,263 | $3,258,069 | $8,592,594 | $11,415,249 | 0.53 |
| D- Services | $79,807,291 | $2,177,580 | $21,567,907 | $30,312,758 | $25,749,046 | 0.62 |
| E- Equipment | $8,810,051 | $155,864 | $311,728 | $4,171,230 | $4,171,230 | 0.21 |
| Parking Garages | $7,484,644 | $0 | $3,742,322 | $3,742,322 | $0 | 0.52 |
| **Sub-Total** | **$150,279,419** | **$8,781,726** | **$40,298,422** | **$49,890,323** | **$51,308,949** | **0.45** |

[2] Figures provided by Cuyahoga County Department of Public Works

*Table 3: Compiled Justice Center High Level Condition Assessment* *__Estimated 12-Year Capital Expenditures by City__*

| CITY | ROM ESTIMATE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $0 | $0 | $0 | $0 | $0 | 0.00 |
| B- Shells | $17,857,375 | $2,048,166 | $10,494,070 | $613,147 | $4,701,993 | 0.39 |
| C- Interiors | $13,990,686 | $8,540 | $7,918,659 | $2,509,337 | $3,554,151 | 0.82 |
| D- Services | $46,805,585 | $176,947 | $34,171,481 | $5,377,421 | $7,079,736 | 0.85 |
| E- Equipment | $313,523 | $0 | $206,719 | $53,402 | $53,402 | 0.24 |
| Parking Garages | $7,156,439 | $0 | $6,065,332 | $946,404 | $144,703 | 0.48 |
| **Sub-Total** | **$86,123,609** | **$2,233,653** | **$58,856,260** | **$9,499,711** | **$15,533,985** | **0.63** |

### 1.2.1. Methodology and Process

This Section contains an overview of the process and methodology employed for the Cuyahoga County Justice Center's facility condition assessment project. At the start of the project and with County and City consultation, the project leadership team provided a refined scope of work tailored to the needs of the County and City. The refined scope of work aligned with the objectives expressed in the RFQ and provided specific direction to ensure long term value in the findings provided in this report.

An initial project kick-off meeting was held in May 2013 with key stakeholders from the County and City. The purpose of the meeting was to discuss overall program objectives, confirm the buildings to be evaluated, establish metrics and weightings to use in work prioritization, determine site access requirements, understand background checks, and establish stakeholders and points of contact.

The following Stage 1 (Data Collection), Stage 2 (Facility Condition Assessment) and Stage 6 (Reporting) represents the contracted scope of work contained in this Report.

#### 1.2.1.1. Data Collection

**__DATA REQUESTED__**

Our team requested physical and planning related data to kick-off the project and insure legacy data was understood by the team at the onset of their work. Data collected included:

- __Facilities.__ Drawings, specifications, past reports, work orders, deficiency reports, itemizations, historical maintenance / janitorial staff counts.
- __Courts.__ Population / demographic data, historical caseload, historical judicial FTEs by court/division, historical staff, organizational tables, external space requirements ant the Marion and Courthouse Square buildings.
- __Jail__. Historic booking records by classification, historic arrest records by classification, average daily population, average length of stay, diversion program information, organizational tables, operations guides, staffing counts.

- Police. Historic booking records by classification, historic arrest records by classification, average daily population, average length of stay, diversion program information, organizational tables, operations guides, staffing counts.

**DATA COLLECTION**
Data Collection and Analysis included an extensive project initiation process, a substantial data request and compilation, review of provided information, electronically organizing and archiving information received, and conducting a utility analysis of the current operations.

**SCANNING AND ARCHIVING**
Thousands of documents and drawings were scanned and archived (on DVDs) dating back to the Justice Center's original planning process and studies completed throughout its lifespan.

**CAPITAL ASSET MANAGEMENT SOFTWARE CONSIDERATIONS**
Our team provided the County with a series of criteria to be considered in a future Request for Qualifications (RFQ) for a comprehensive enterprise solution. The team focused on an asset management software solution that should be created or adapted from one of many programs available on the market. The purpose is to aid in the planning of facilities predictive and preventative maintenance needs and asset replacement over the course of the asset's lifespan.

**IN-BRIEF AND INTERVIEWS**
An in-brief meeting was held with the on-site point of contact, facility representatives, and County and City assigned representative(s) at the start of the site assessment. The purpose of the in-brief was to explain the scope of inspections, identify procedures for secure and/or unavailable areas to be inspected, coordinate schedules, confirm access to facilities, generally discuss the site survey process, and to gather any final missing drawings or data. The Assessment Team interviewed County and City staff to gain additional information on non-visual asset system issues and to document current and prior maintenance activities.

**SITE INSPECTION**
The Assessment Team consisted of appropriate disciplines necessary to achieve the scope of work. Typical team members included architects, general building inspectors, exterior envelope specialists, structural engineers, electrical engineers, mechanical engineers, IT specialists, security specialists, and vertical transportation specialists. The basis for inspections was conducted in accordance with ASTM E2018-08 as well as building codes, standards, and our own assessment expertise.

#### 1.2.1.2. Facility Condition Assessment

The assessment included a full review of its operations, physical condition, and recommendations for upgrades to the facility that enables the buildings to function more effectively and efficiently for the next 25+ years. The assessment was performed by building specialists who appraised the current building conditions, deficiencies, maintenance operations, technology, and security systems and operations. Physical components included but were not limited to:

- Exterior Plaza Construction
- Exterior Envelope: roof, walls, windows
- Interior Construction: walls, doors, flooring, ceilings, finishes
- HVAC Systems and Components
- Automated Building Systems
- Plumbing Systems and Components
- Electrical Systems and Components
- UPS Systems. Emergency Generators and Associated Components
- Security Systems: access controls, video cameras and monitoring
- Data and Communications Systems and Components
- Fire Alarms and Fire Protection Systems
- Vertical Circulation: escalators, service elevators, elevators

The Assessment Team developed descriptions for each component, identified the current condition of these components, interviewed maintenance staff, and made recommendations for upgrades or component renewals.

**TRAINING**

A training program was developed specific to the assessment of the Justice Center Complex. This program was intended to provide the Assessment Team specific assessment procedures, site specific issues, safety practices, client interface, and analysis of building construction and techniques unique to the Justice Center Complex. Periodic training briefs were performed throughout the contract period to ensure a consistent approach to the project.

**DATA ANALYSIS**

During this phase, the results of the site-inspections, staff interviews, and County-City provided resources were compiled and analyzed. Data analysis included: asset/ sub-element data updated; building sub-elements inventoried and input into the report to include units of measure, age, material type, condition, remaining life cycle predictions, and descriptions. Deficiencies are identified at the element level with a complete description of inspection findings to include descriptions, photographs, and cost estimates for each resolutions. Key data included assets, components, deficiencies, and resolutions. Based on the analyzed information, we are offering specific recommendations for updating and improving the Justice Center.

**DATA QUALITY CONTROL**

Quality control was a critical part of our Assessment Team's methodology to ensure accurate and, consistent results. A rigorous in-house Quality Control/Quality Assurance (QC/QA) program was maintained that included standardized processes and procedures, training, ongoing "over-the-shoulder" quality control checks, and technical and editorial reviews of the reporting.

#### 1.2.1.3. Facility Assessment Reporting

The Assessment Team collected data from existing records, user and facility management interviews, site visit observations, digital photographs and written notes. Resulting data was provided as an overall facility description with a supporting list of deficiencies:

- Deficiency: Narrative describing deficiencies broken down into prime components:
  - Foundations and Superstructure
  - Roof system
  - Exterior enclosure
  - Interior Construction
  - Stairs
  - Interior Finishes
  - Conveying
  - Plumbing
  - HVAC Systems
  - Fire Protection
  - Electrical: Communication, Security
- Contributing Factor: Narrative of cause or reason for deficiency
- Resolution: Narrative of recommendation to correct or resolve deficiency

*Table 4: Compiled Expanded Components Value, Condition Index and Estimated Capital Expenditures by Priority*

| **COMPONENTS** | **ROM VALUE** | | **Year 1** | **Year 2-4** | **Year 5-8** | **Year 9-12** | **CI** |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| A10- Foundations | $4,759,849 | | $0 | $0 | $10,336 | $0 | 0.00 |
| B10- Superstructure | $65,276,109 | | $0 | $6,815,820 | $2,505,087 | $0 | 0.14 |
| B20- Exterior Enclosure | $70,952,347 | | $8,476,185 | $4,859,912 | $798,152 | $14,675,416 | 0.41 |
| B30- Roofing | $11,894,810 | | $0 | $10,236,733 | $370,991 | $0 | 0.89 |
| C10- Interior Construction | $38,082,409 | | $0 | $5,943,828 | $6,099,309 | $9,040,892 | 0.55 |
| C20- Stairs | $5,578,650 | | $0 | $0 | $0 | $209,475 | 0.04 |
| C30- Interior Finishes | $17,008,337 | | $28,803 | $5,232,899 | $5,002,622 | $5,719,033 | 0.94 |
| D10- Conveying | $17,267,906 | | $1,588,289 | $4,134,375 | $0 | $0 | 0.33 |
| D20- Plumbing | $12,841,582 | | $0 | $2,439,479 | $3,211,824 | $2,975,695 | 0.67 |
| D30- HVAC | $69,665,004 | | $723,516 | $27,437,847 | $19,970,599 | $14,037,771 | 0.89 |
| D40- Fire Protection | $14,629,651 | | $8,269 | $2,424,811 | $0 | $1,183,877 | 0.25 |
| D50- Electrical | $69,692,817 | | $34,453 | $19,302,876 | $12,507,756 | $14,631,440 | 0.67 |
| E- Equipment/Jail | $43,672,643 | | $155,864 | $518,446 | $4,224,632 | $4,224,632 | 0.21 |
| E- Garage | $29,250,703 | | $0 | $9,807,654 | $4,688,726 | $144,703 | 0.50 |
| **Total** | **$470,572,819** | | **$11,015,379** | **$99,154,682** | **$59,390,033** | **$66,842,933** | **0.50** |

### 1.2.1.4. Components and Buildings

**ACCESSIBILITY**

The Assessment Team performed an accessibility study for the Cuyahoga County Justice Center including the Courts Tower, Jail I, Jail II, Atrium, Police Building, and exterior site features encompassing the building. This study was based on two primary documents: Cuyahoga County's "Universal Design Standards" (UDS) of 2004 and ANSI's A117.1-2009 which correlates with the Ohio Building Code. Overall, the Report broadly identifies deficiencies and resolutions regarding accessibility, and looks at accessibility for individuals with a wide range of disabilities.

Today the building is non-compliant with the requirements stated above. As the facility is renovated accessibility upgrades should be included. Areas that do not require renovation / replacement in the next 10 years (i.e. jails) will require specific accessibility upgrades to bring those areas into compliance. For additional information refer to Appendix F to review the detailed Accessibility Report.

**SECURITY**

The security systems examined in the Justice Center's security condition assessment fall into eleven categories. The full Report, found in Appendix G, provides detailed inventory and recommendations.

- Force Protection, Access Control Systems, Locking Control Systems, Security Hardware, Security Keys for Detention Openings, Closed Circuit Television Systems, Duress Systems, Watch Tour Systems, Physical Security Elements, Visitation and Arraignment, Other Systems to Consider

**CONVEYANCE**

The Cuyahoga County Justice Center maintains multiple traction passenger elevators, traction service elevators, and escalators in the Atrium building and in the Corrections Center (Jail I). With the exception of elevators in Jail II and the Police Building (which are recommended for replacement within the next two years) most equipment was upgraded in 2002 and has 20-25 years remaining in the life cycle. For additional information refer to Appendix H to review the full Conveyance Report.

**SITE**

A large plaza surrounds the complex along Ontario Street, Lakeside Avenue, West 3rd Street, and St. Clair Avenue. Cast-in-place concrete slab-on-grade sidewalks are adjacent to the street curbs. The north Atrium entrance is approached by a monumental stairway that consists of cast-in-place concrete curbs/nosings with brick paver treads. Grass areas bounded by curbs and/or retaining walls are located adjacent to the Jail II building along St. Clair Avenue, adjacent to the Jail 1 building along Lakeside Avenue, and adjacent to the Courts Tower building along Ontario Street and Lakeside Avenue.

Overall the site is in good condition. The plaza deck surface continues to be maintained and repaired as needed due to use and environmental conditions. There are two primary needs for the site surrounding the Justice Center: physical security requirements and accessibility which are both are detailed in Appendix F and G respectively.

**ATRIUM**

The Atrium at the Cuyahoga County Justice Center (CUYAHOGA COUNTY JUSTICE CENTER) is a five-story structure that physically links the Courts Tower, Jail 1, Jail II, and Cleveland Police Municipal HQ at a central hub.

The Atrium building is in relatively good condition with some system renewals required in years 1, 2-4 and at the end of the renovation program (Year 12). The Assessment Team's findings reflect an immediate need to address some building services initially including the ventilation systems followed by building façade elements, conveyance upgrades, security, and interior finishes.

*Table 5: Atrium Building Summary*

| COMPONENTS | ROM VALUE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $944,625 | $0 | $0 | $0 | $0 | 0.00 |
| B- Shells | $10,960,590 | $263,294 | $49,702 | $370,991 | $1,093,329 | 0.16 |
| C- Interiors | $5,621,862 | $28,803 | $684,782 | $0 | $3,050,513 | 0.67 |
| D- Services | $17,654,514 | $589,148 | $719,300 | $0 | $6,491,104 | 0.44 |
| E- Equipment | $786,358 | $0 | $0 | $0 | $0 | 0.00 |
| Parking Garages | $0 | $0 | $0 | $0 | $0 | 0.00 |
| **Sub-Total** | **$35,967,947** | **$881,245** | **$1,453,784** | **$370,991** | **$10,634,945** | **0.37** |

**COURTS TOWER**

The Courts Tower at the Cuyahoga County Justice Center is a 26-story structure that includes two lower level private parking garages: Parking Level 1 and Parking Level 2 (PK-1 and PK-2).

The Courts Tower facility is in fair to poor condition because of the age of the infrastructure. As outlined in the Table below, the building services, interior finishes, and building shell will require extensive capital investment over the next 12 years. Immediate requirements include improvements to the building façade to maintain water tightness, renovation of building services and interior finishes, and improvements to the parking garage structure.

*Table 6: Courts Tower Building Summary*

| COMPONENTS | ROM VALUE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $1,472,738 | $0 | $0 | $0 | $0 | 0.00 |
| B- Shells | $61,175,238 | $5,005,626 | $4,185,101 | $1,674,422 | $6,399,143 | 0.28 |
| C- Interiors | $24,616,765 | $0 | $2,070,744 | $8,452,030 | $8,740,444 | 0.78 |
| D- Services | $71,969,485 | $0 | $19,430,862 | $17,432,823 | $17,467,276 | 0.75 |
| E- Equipment | $29,768 | $0 | $0 | $0 | $0 | 0.00 |
| Parking Garages | $11,025,000 | $0 | $2,401,383 | $2,401,383 | $0 | 0.44 |
| **Sub-Total** | **$170,288,993** | **$5,005,626** | **$28,088,090** | **$29,960,658** | **$32,606,863** | **0.56** |

**CORRECTIONS CENTER (Jail I)**

The Corrections Center Jail I at the Cuyahoga County Justice Center is a 10-story structure including two lower level private parking garages: Parking Level 1 and Parking Level 2 (PK-1 and PK-2).

Much like the Courts Tower, the Jail I facility requires extensive capital outlay over the next 12 years for repair and maintenance. It is recommended that the County make an initial investment in the building shell followed by a longer term replacement of all interior finishes, services, equipment and parking garage structure.

*Table 7: Jail I Building Summary*

| COMPONENTS | ROM VALUE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $710,167 | $0 | $0 | $0 | $0 | 0.00 |
| B- Shells | $34,345,094 | $2,745,875 | $7,934,289 | $819,984 | $4,658,250 | 0.47 |
| C- Interiors | $14,488,465 | $0 | $893,854 | $2,176,584 | $2,935,327 | 0.41 |
| D- Services | $41,954,354 | $146,081 | $5,666,825 | $17,506,278 | $2,513,466 | 0.62 |
| E- Equipment | $26,618,967 | $0 | $0 | $3,445,313 | $3,445,313 | 0.26 |
| Parking Garages | $6,752,813 | $0 | $2,076,490 | $2,076,490 | $0 | 0.62 |
| **Sub-Total** | **$124,869,860** | **$2,891,957** | **$16,571,457** | **$26,024,648** | **$13,552,355** | **0.47** |

**JAIL II**

The Jail II building consists of a nine (9)-story structural steel frame structure on top of a one (1)-story underground reinforced concrete basement structure.

The Jail II building, constructed in 1995, is in good condition. For the short term the conveyance system makes up the bulk of capital needs, followed by maintenance requirements to preserve the building shell, and a planned renewal of building services. Replacement of the primary HVAC system represents a significant capital outlay at the end of the Capital program (years 9-12).

*Table 8: Jail II Building Summary*

| COMPONENTS | ROM VALUE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $711,572 | $0 | $0 | $10,336 | $0 | 0.01 |
| B- Shells | $17,176,111 | $0 | $612,838 | $808,833 | $93,386 | 0.09 |
| C- Interiors | $8,060,839 | $0 | $432,103 | $473,317 | $199,016 | 0.14 |
| D- Services | $24,296,813 | $1,619,297 | $1,743,328 | $751,078 | $6,356,937 | 0.43 |
| E- Equipment | $15,586,387 | $155,864 | $311,728 | $779,319 | $779,319 | 0.13 |
| Parking Garages | $0 | $0 | $0 | $0 | $0 | 0.00 |
| **Sub-Total** | **$65,831,721** | **$1,775,161** | **$3,099,997** | **$2,822,883** | **$7,428,658** | **0.23** |

**CLEVELAND METROPOLITAN POLICE HEADQUARTERS (Police Building)**

The Police Building is a nine (9)-story structure including two lower level private parking garages: Parking Level 1 and Parking Level 2 (PK-1 and PK-2).

The Police building is in poor condition primarily due to its age, limited ongoing maintenance, and 24/7 use. Major renewals are recommended to begin as soon as feasibly possible (years 2-4) and represent a complete renovation of the facilities and improvements to the below grade parking structure.

*Table 9: Compiled Police Building*

| COMPONENTS | ROM VALUE | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| A- Substructures | $920,748 | $0 | $0 | $0 | $0 | 0.00 |
| B- Shells | $24,466,233 | $461,391 | $9,130,536 | $0 | $2,431,309 | 0.49 |
| C- Interiors | $7,881,466 | $0 | $7,095,245 | $0 | $44,100 | 0.91 |
| D- Services | $28,221,795 | $0 | $28,179,073 | $0 | $0 | 1.00 |
| E- Equipment | $651,164 | $0 | $206,719 | $0 | $0 | 0.32 |
| Parking Garages | $11,472,891 | $0 | $5,329,781 | $210,853 | $144,703 | 0.50 |
| **Sub-Total** | **$73,614,297** | **$461,391** | **$49,941,354** | **$210,853** | **$2,620,112** | **0.72** |

#### 1.2.1.5. Best Practices / Lessons Learned

This overall assessment provides County and City facility results, observations, costing, lessons learned / best practices, capital plan, and suggestions for future improvements to the facility. The purpose of this Section is to memorialize the observed lessons learned / recommended best practices moving forward. Assessment teams and facility maintenance staff discussed these observations during site visits. These discussions have been summarized by discipline including building envelope, structural, building interiors, mechanical / plumbing, electrical, technology, and fire protection.

### 1.2.1.6. Top Issues

In anticipation of the significant expenditure, Cuyahoga County requested preparation of a “Top Issues List” of recommended repairs / maintenance for the Justice Center Complex. We have based our Top Issues recommendation list on urgent repair needs, without consideration of budget constraints. The list parallels the systems that were analyzed as part of the facility condition assessment. The items listed are essential functions that must be maintained by the County and City to prolong the useful life of the Justice Center Complex. A list of items to be considered in the FY14 capital budget was provided with rough order of magnitude cost estimates. Each item should be considered a priority with respect to the building system they represent. Various spreadsheets prepared represent these findings in addition to prepared narratives.

### 1.2.1.7. Sustainable Design

Sustainability is the capacity to endure and is not tied exclusively to “environmentally friendly” products and practices. Restoration, renovation and maintenance of an existing structure to prolong its service life is sustaining the structure. Ensuring that the products and practices selected offer the lowest impact to the environment is sustainably responsible.

The purpose of this Section is to describe potential sustainable measures that can be implemented at the Justice Center Complex. For building modernization and interior renovation projects we recommend projects being designed and constructed to LEED Silver levels at a minimum. The following is a summary of potential sustainable best practices from the LEED v2009 Existing Buildings Operation and Maintenance (EBOM) rating system that we recommend as a guide for future renovations.

- Building Exterior and Hardscape Management Plan. Develop and use a low-impact site and green building exterior management plan that addresses building exterior and hardscape.
- Integrated Pest Management, Erosion Control and Landscape Management Plan. Develop and use a low-impact site and green building exterior management plan that addresses the site’s natural components, including overall site management, chemicals, fertilizers, landscape waste, and pest management.
- Water Efficiency, Plumbing Fixtures. Reduce potable water consumption by using low-flow plumbing fixtures.
- Optimize Energy Efficiency Performance. Achieve an increased level of operating energy efficiency performance relative to typical buildings of similar type by improving building mechanical systems, roof, and façade.
- Commissioning. Implement a commissioning program that addresses ongoing building usage changes and maintenance needs.
- Performance Measurement. Install real-time energy and water consumption metering and sub-metering which can be monitored and trended through the Building Automation System (BAS).

- Refrigerant Management. Use refrigerants that minimize or eliminate the emission of compounds contributing to ozone depletion and global warming in packaged unitary HVAC cooling equipment, fire-suppression systems, electric water coolers and appliance such as refrigerators and freezers.
- Solid Waste Management. Maintain a waste reduction and recycling program for office equipment (computers, monitors, copiers, printers, scanners, and fax machines), appliances (refrigerators, dishwashers, and water coolers), paper, toner cartridges, batteries, glass, plastics, cardboard, food waste and metals.
- Improve Building Air Quality. Meet or exceed ASHRAE 62.1-2007 ventilation requirements and maintain a healthier environment.
- Occupant Comfort. Provide a high level of lighting and temperature control by individual occupants or groups in multi-occupant spaces.
- Green Cleaning. Implement a high-performance cleaning program, supported by policy, staffing plans, standard operating and storage procedures that address sustainable and effective cleaning.

#### 1.2.1.8. Life Cycle Cost Analysis

As part of the facility assessment, a separate lifecycle cost analysis was performed for the Courts Tower, Atrium, Jail I, Jail II and the Police Building. Energy models of each building were developed using construction drawings and information obtained during the data collection phase. The energy models were calibrated to match the buildings' actual energy consumption. Opportunities for energy reduction were identified and modeled to determine energy cost savings. Detailed cost estimates were performed for each energy conservation measure (ECM) to determine the cost of implementation. The simple payback of each ECM was calculated to determine which ECMs should be recommended. Refer to the table below for a summary of the 29 ECMs identified.

| Building | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings: Electricity | Annual Savings: District Steam | Annual Savings: District Chilled Water | Annual Savings: Total Energy | Annual Savings: Energy Cost Savings | Annual Savings: Maintenance Cost Savings (1) | Metrics: Expected Useful life | Metrics: Simple Payback Period (SPP) | Metrics: Cumulative SPP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| Jail I | Occupancy Sensors | $60,779 | 591,016 | 60 | 82,450 | 3,078 | $72,409 | $0 | 20 | 0.8 | 0.8 |
| Police | Occupancy Sensors | $107,855 | 906,517 | -385 | 88,750 | 3,698 | $86,697 | $0 | 20 | 1.2 | 1.1 |
| Court Tower | Occupancy Sensors | $145,311 | 358,149 | -4 | 44,967 | 1,757 | $41,164 | $0 | 20 | 3.5 | 1.6 |
| Court Tower | Variable Primary Pumps | $733,616 | 1,599,073 | 0 | 0 | 5,456 | $111,935 | $50,000 | 30 | 4.5 | 2.9 |
| Police | LED Lighting Upgrade | $1,291,280 | 1,219,172 | -181 | 172,492 | 6,014 | $143,345 | $133,109 | 20 | 4.7 | 3.7 |
| Jail I | Garage Heat Recovery & CO2 | $475,952 | 121,649 | 3,814 | 0 | 4,969 | $94,759 | $0 | 30 | 5.0 | 3.8 |
| Jail I | Variable Primary Pumps | $490,991 | 765,268 | 0 | 0 | 2,611 | $53,569 | $30,000 | 30 | 5.9 | 4.0 |
| Jail II | Occupancy Sensors | $51,923 | 99,188 | -86 | 9,333 | 347 | $8,351 | $0 | 20 | 6.2 | 4.1 |
| Jail I | LED Lighting Upgrade | $1,760,589 | 1,195,120 | -99 | 189,492 | 6,233 | $149,635 | $120,200 | 20 | 6.5 | 4.7 |
| Court Tower | Garage LED Lighting | $188,541 | 168,057 | 0 | 0 | 573 | $11,764 | $13,840 | 20 | 7.4 | 4.7 |
| Jail I | Garage LED Lighting | $75,083 | 66,926 | 0 | 0 | 228 | $4,685 | $5,512 | 20 | 7.4 | 4.8 |
| Police | Façade Maintenance | $352,648 | 6,020 | 1,951 | 8,242 | 2,449 | $47,497 | $0 | 40 | 7.4 | 4.9 |
| Court Tower | LED Lighting Upgrade | $2,019,997 | 595,427 | 537 | 143,808 | 4,398 | $105,593 | $139,881 | 20 | 8.2 | 5.4 |
| Police | Variable Speed Pumps | $365,462 | 446,325 | 0 | 0 | 1,523 | $31,243 | $10,000 | 30 | 8.9 | 5.5 |
| Jail II | LED Lighting Upgrade | $547,170 | 367,266 | -476 | 38,767 | 1,150 | $28,897 | $23,460 | 20 | 10.5 | 5.7 |
| Jail I | Façade Maintenance | $636,435 | 69,080 | 2,197 | -3,250 | 2,820 | $53,332 | $0 | 40 | 11.9 | 5.9 |
| Police | VAV with Advanced Controls | $3,565,081 | 807,637 | 2,317 | 387,292 | 10,170 | $248,345 | $30,000 | 30 | 12.8 | 7.0 |
| Police | Garage LED Lighting | $126,104 | 84,201 | -94 | 0 | 175 | $3,768 | $4,547 | 20 | 15.2 | 7.0 |
| Court Tower | VAV with Advanced Controls | $13,812,502 | 2,739,128 | 6,802 | 882,908 | 28,063 | $663,389 | $220,000 | 30 | 15.6 | 9.8 |
| Jail II | VAV with Advanced Controls | $3,790,099 | 986,794 | 4,710 | -75,617 | 8,083 | $148,336 | $80,000 | 30 | 16.6 | 10.3 |
| Jail II | Variable Speed Pumps | $280,293 | 237,335 | 0 | 0 | 810 | $16,613 | $0 | 30 | 16.9 | 10.3 |
| Court Tower | Daylight Harvesting | $761,211 | 270,509 | 162 | 61,458 | 1,854 | $44,730 | $0 | 20 | 17.0 | 10.4 |
| Jail I | VAV with Advanced Controls | $7,040,204 | 1,385,672 | 4,787 | 257,383 | 13,532 | $297,891 | $50,000 | 30 | 20.2 | 11.4 |
| Court Tower | Façade Maintenance | $685,462 | -15,192 | 1,108 | -15,283 | 1,088 | $18,487 | $0 | 40 | 37.1 | 11.6 |
| Court Tower | Window Upgrade | $12,684,627 | 553,384 | 6,953 | 261,675 | 13,330 | $290,151 | $0 | 30 | 43.7 | 14.1 |
| Jail II | Roof Replacement | $398,199 | 2,706 | 52 | 1,417 | 88 | $1,872 | $0 | 40 | 212.8 | 14.2 |
| Jail I | Roof Replacement | $799,465 | -13,152 | 105 | 942 | 91 | $1,782 | $0 | 40 | 448.7 | 14.4 |
| Police | Roof Replacement | $591,627 | -1,096 | 44 | 900 | 59 | $1,232 | $0 | 40 | 480.2 | 14.6 |
| Court Tower | Roof Replacement | $2,081,972 | 1,700 | 74 | 575 | 101 | $1,992 | $0 | 40 | 1045.0 | 15.1 |
| **Total** | | **$55,920,476** | **15,613,879** | **34,346** | **2,538,700** | **124,748** | **$2,783,464** | **$910,550** | **29.7** | **15.1** | |

(1) Does not include cost of replacing existing HVAC system with the same equipment in five years.

## 1.3. Recommended Next Steps

The County and City requested that recommendations for future projects and maintenance were included in the overall report.

Recommendations are included for each facility and building component assessed. Section 5.3 of this Report provides an optional "Rough Order of Magnitude" estimate for constructing a new Judicial Center. However, the capital plan below is based on the decision to modernize the existing Justice Center Complex, creating a stand-alone police facility to house key departments, and continued use of the Justice Center to serve its needs for the next 25+ years.

## 1.4. Capital Planning

The Capital Improvement Program (CIP) is a twelve (12)-year plan that identifies capital projects and component renewals throughout the Justice Center Complex. The plan is a link between the items described in this Report and the annual budget. The benefits of creating this CIP include:

- Systematic Evaluation. Allowing for a systematic evaluation of all potential projects at the same time to determine their viability within a scheduled timeframe.
- Financial. The ability to stabilize debt and consolidate projects, reducing capital and borrowing costs.
- Schedule and Budget. Providing alignment of schedule and budget to share with user groups in the Justice Center Complex.
- The Future. Bridge the planning and assessment documents to achieve the operational and functional needs of the Justice Center Complex.

The CIP includes three categories:

- Component description and units of measurement.
- Component renewals ranked by year.
    - This is based upon two primary factors – the recommendations made by the Assessment Team and the requirements determined by the Planning Team.
- A timetable recommended for the completion of this work.

Given the magnitude, intricacy, component life expectancy, and inter-relation of the work performance and operations at the Justice Center Complex, a capital plan was developed which outlines a diverse planning methodology. The CIP is broken into several year increments: year 1, years 2-4, 5-8, and 9-12.

Refer to Appendix M for the proposed major capital projects schedule.

Cost estimates in 2013 dollars are provided for deferred maintenance, remodel, renovation, and component replacement requirements. Cost estimates used in the report were sourced through RSMeans™ and using local construction experience. Cost estimates and values are expressed as Rough Order of Magnitude (ROM) and intended for high level evaluation. Project cost estimates account for average regional construction including contractor markups, overhead and profit, and owner soft costs (architectural/engineering fees, project management fees, and contingencies). Project cost estimates do not account for land acquisition, site development, escalation, furniture/fixture/equipment fees, or the cost of financing.

Below is a four-part multi-year capital forecast for the Justice Center Complex with an assumed start date of January 2015. The four-part plan aligns the needs identified in the Planning Report with the physical component life expectancy, deferred maintenance, and life safety needs at the Justice Center Complex. The following primary categories were included:

- Year 1. The items identified in year 1 are essential to deferred maintenance, life safety, and/or useful life expiration. Deferred maintenance includes repairs or improvements to building components that are expected to remain in place throughout the capital plan. Life safety components are items required to bring the building to current code compliance or those components that have failed and need to be replaced immediately. Life expiration are those components that have a decreased life expectancy and are failing to serve their intended purpose. There includes a major modernization of the Jail II elevator component as was completed in the Courts Tower and Corrections Center in 2002. We also recommend that all Cleveland Police archival records be relocated off-site and the museum be relocated. Year 1 also includes the start of phased design services for the complex renovation of both the City and County portions of the Justice Center Complex.

  In Year 1 (2015) we anticipate a total capital expenditure of approximately $11,000,000. The County is expected to begin work on some components of Year 1 projects in FY14. Accordingly, those amounts would reduce the FY15 project / capital request. This would include the City selected A/E team to design the new off-site police building.

*Table 10: Year 1 Capital Plan Expenditures*

| Facility | BUILT | Quantity | Units | ROM VALUE | Year 1 | CI |
|---|---|---|---|---|---|---|
| **Atrium** | 1976 | 136,357 | SF | $35,967,947 | $881,245 | 0.02 |
| **Courts Tower** | 1976 | 671,485 | SF | $170,288,993 | $5,005,626 | 0.03 |
| **Jail I** | 1976 | 380,758 | SF | $124,869,860 | $2,891,957 | 0.02 |
| **Jail II** | 1995 | 226,419 | SF | $65,831,721 | $1,775,161 | 0.03 |
| **Police** | 1976 | 270,000 | SF | $73,614,297 | $461,391 | 0.01 |
| **Total** | | **1,685,019** | **SF** | **$470,572,819** | **$11,015,379** | |

- Years 2-4. The majority of work in this period centers on the consolidation of the police spaces to the upper floors of the police building, construction of a new police headquarters building at the City of Cleveland Gun Range, , and readying the courts building for a 10-year renovation. . The replacement of major components (electrical and mechanical) in the Courts Tower is recommended to be completed prior to the start of individual tower floor renovations, roof replacements across the complex, parking garage improvements, and a major renovation of the police building. This major renovation consolidates the police and enables multiple court functions to relocate to the police headquarters building freeing up two floors of space in the Courts Tower for operations staging purposes. This plan period includes renovation of floors five and twenty-four containing the mechanical equipment. Following the system replacement, it is recommended that the renovation of floors six, seven, eight, and nine, in Year 4 be completed by April 2017. We recommend a new central booking center be established in the Corrections Center and relocation of the Sheriff Department's Investigative Unit before the end of Year 3.

Years 2-4 are major investment years for the Police Headquarters Building, building envelopes, and infrastructure which will enable the balance of projects to move forward. In total the capital fund estimate for Years 2-4 is approximately $100,000,000. The annual breakdown of this investment is approximately $33,000,000.

*Table 11: Years 2-4 Capital Plan Expenditures*

| Facility | BUILT | Quantity | Units | ROM VALUE | Year 2-4 | CI |
|---|---|---|---|---|---|---|
| **Atrium** | 1976 | 136,357 | SF | $35,967,947 | $1,453,784 | 0.06 |
| **Courts Tower** | 1976 | 671,485 | SF | $170,288,993 | $28,088,090 | 0.19 |
| **Jail I** | 1976 | 380,758 | SF | $127,970,641 | $16,571,457 | 0.15 |
| **Jail II** | 1995 | 226,419 | SF | $65,831,721 | $3,099,997 | 0.07 |
| **Police** | 1976 | 270,000 | SF | $73,614,297 | $49,941,354 | 0.68 |
| **Total** | | **1,685,019** | **SF** | **$473,673,600** | **$99,154,682** | |

- Years 5-8. Years 5-8 will focus on remodeling Courts Tower. Upon completion and with temporary measures in place floors 1-4 can be renovated by mid-2018 with a three-month move process scheduled. This enables all external leases to be cancelled or concluded by December 2018. In October 2018, the Courts floor renovations would begin. Floors seven, eight, nine, and the Housing Court will be finished by October 2019 with the remainder of the year allocated for the move process. In the 5th and 6th years recommendations include replacement of the HVAC systems in the Corrections Center, security improvements, and jail equipment upgrades. Several areas of deferred maintenance are addressed in the Corrections Center and Jail II. Component renewals will address those building elements that have surpassed their useful life and need to be replaced as they are or will soon no longer serve their intended purpose. During this period of time we recommend instituting a preventative maintenance program for all new construction components. Several Courts floors should be renovated during this period of time including:
    - Floor 10-11 in to courts – April 2020
    - Floor 23-22 – October 2020
    - Floor 21-20 – April 2021
    - Floor 19-18 – October 2021

Years 5, 6, 7, and 8 primarily represents staging the lower floors of the courts tower for renovation and continuing deferred maintenance projects. This work totals approximately $60,000,000 which represents an annual capital investment for this period of $15,000,000.

*Table 12: Years 5-8 Capital Plan Expenditures*

| Facility | BUILT | Quantity | Units | ROM VALUE | Year 5-8 | CI |
|---|---|---|---|---|---|---|
| **Atrium** | 1976 | 136,357 | SF | $35,967,947 | $370,991 | 0.08 |
| **Courts Tower** | 1976 | 671,485 | SF | $170,288,993 | $29,960,658 | 0.37 |
| **Jail I** | 1976 | 380,758 | SF | $127,970,641 | $26,024,648 | 0.36 |
| **Jail II** | 1995 | 226,419 | SF | $65,831,721 | $2,822,883 | 0.12 |
| **Police** | 1976 | 270,000 | SF | $73,614,297 | $210,853 | 0.69 |
| **Total** | | **1,685,019** | **SF** | **$473,673,600** | **$59,390,033** | |

- Year 9-12. The balance of Courts floors are recommended for renovation during this period of time. The following is anticipated:
  - Floor 17-16 – April 2022
  - Floor 15-14 – October 2022
  - Floor 13-12 – April 2023
  - Floor 9 – October 2023 (temporary renovation)
  - Floor 1 – January 2024
  - Floor 4 – April 2023
  - Floor 9 – July 2024 is renovated permanently for the Clerk
  - Floor 2 – October 2024
  - Floor 3 – February 2025

The team estimates that every six months an interior contractor with proper planning should be able to update two Courts floors. Additionally, the HVAC system in Jail II should be replaced during this time period and the balance of jail equipment should be replaced in the Corrections Center. The remaining years complete renovations of the atrium and the remaining component renewals in the Corrections Center and Jail II. Major efforts also include replacement of the existing single pane window systems with new energy efficient replacements. Given the duration from the start to completion of this work, we anticipate the need for additional component renewals. By completion, the entire facility will be fully refreshed and serving its intended purpose from an operational and physical plant perspective.

Years 9, 10, 11, and 12 concludes the major capital renewal of the Courts Tower as well as Jail II system renewals at a cost estimate of approximately $67,000,000. The investment during this period is approximately $17,000,000 annually.

*Table 13: Years 9-12 Capital Plan Expenditures*

| Facility | BUILT | Quantity | Units | ROM VALUE | Year 9-12 | CI |
|---|---|---|---|---|---|---|
| **Atrium** | 1976 | 136,357 | SF | $35,967,947 | $10,634,945 | 0.37 |
| **Courts Tower** | 1976 | 671,485 | SF | $170,288,993 | $32,606,863 | 0.56 |
| **Jail I** | 1976 | 380,758 | SF | $127,970,641 | $13,552,355 | 0.46 |
| **Jail II** | 1995 | 226,419 | SF | $65,831,721 | $7,428,658 | 0.23 |
| **Police** | 1976 | 270,000 | SF | $73,614,297 | $2,620,112 | 0.72 |
| **Total** | | **1,685,019** | **SF** | **$473,673,600** | **$66,842,933** | |

- Years 13-20. For the final eight years of the 20-year plan we recommend maintaining an aggressive preventative maintenance program with renewal of shorter useful life span elements such as interior finishes and service systems.

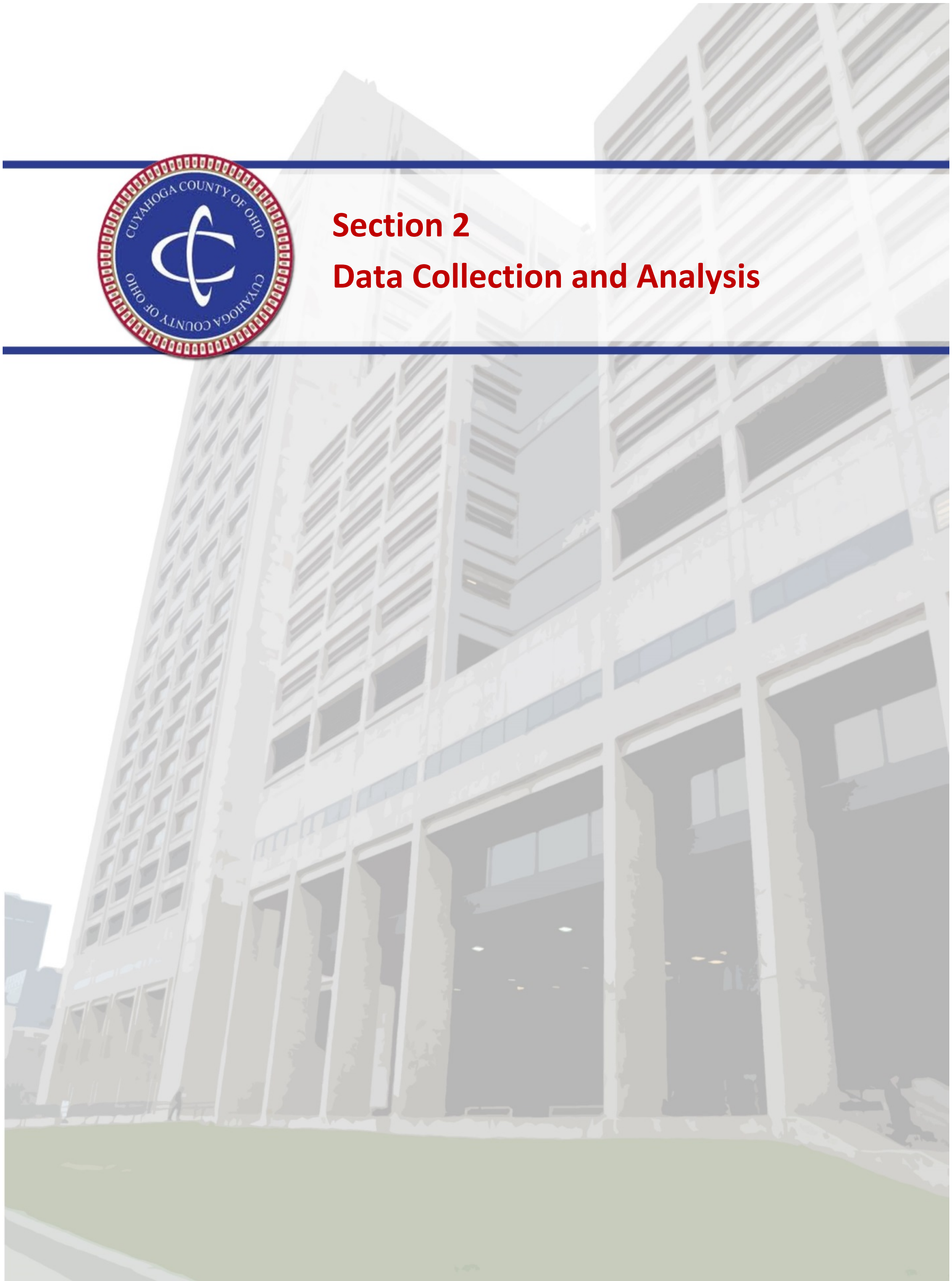
As outlined above the Capital Improvement Plan emphasizes expenditures in the first 12-years due to existing conditions caused by environmental elements, aging and wear, and current needs required to bring the facility up to standards and to advance the physical complex into a condition that can be more efficiently and effectively managed.

*Table 14: Summary of Years 1-12 Capital Plan Expenditures*

| Facility | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | TOTAL | Annually |
|---|---|---|---|---|---|---|
| **Atrium** | $881,245 | $1,453,784 | $370,991 | $10,634,945 | $13,340,965 | $1,111,747 |
| **Courts Tower** | $5,005,626 | $28,088,090 | $29,960,658 | $32,606,863 | $95,661,236 | $7,971,770 |
| **Jail I** | $2,891,957 | $16,571,457 | $26,024,648 | $13,552,355 | $59,040,417 | $4,920,035 |
| **Jail II** | $1,775,161 | $3,099,997 | $2,822,883 | $7,428,658 | $15,126,699 | $1,260,558 |
| **Police** | $461,391 | $49,941,354 | $210,853 | $2,620,112 | $53,233,710 | $4,436,142 |
| **Total** | **$11,015,379** | **$99,154,682** | **$59,390,033** | **$66,842,933** | **$236,403,027** | **$19,700,252** |

Currently, four (4) years of funding exists for the CIP. The funding is less than what is needed to complete all recommended capital projects. The County and City should consider bonding the costs over a number of years greater than the duration of the work to be performed.

While the CIP is prepared separately from the operating budget, the two budgets have a direct relationship. As capital projects are completed then custodial and preventative maintenance of the Justice Center facilities should be incorporated into the operating budget outside of this Report.



# Section 2
# Data Collection and Analysis

# 2. DATA COLLECTION AND ANALYSIS

The Data Collection and Analysis phase of this project examined the relationship between contractual requirements and operational function of the Justice Center Complex. Data collection included an extensive project initiation process, a substantial data request and compilation, review of collected data, electronically organizing and archiving data received, and conducting a utility analysis of the current operations.

## 2.1. Project Initiation

Cuyahoga County and the City of Cleveland requested an assessment of the entire Justice Center Complex and development of a plan for accommodating the operational and spatial needs of its occupants. The assessment also includes recommendations for upgrades to the facility to increase efficiency of operations. The requirements of the study were summarized in the County's Request for Qualifications (RQ25309) for Professional Services dated October 15, 2012.

The County and City awarded the Osborn / K2M / Rosser team, through County Council of Cuyahoga County Ohio Resolution No. R2013-0097, the task to undertake a comprehensive facility conditions assessment and development of a comprehensive capital plan. The comprehensive analysis below develops a strategic plan for addressing the current building conditions, deficiencies, operations, technology, organizational structure between County and City, safety, security, and strives to enhance the Justice Center's functionality and physical performance.

The project timeline was as follows:

- <u>Project Award Meeting:</u> Held on January 11, 2013 to discuss project initiation. The purpose of the meeting was to establish the final scope of work required in order to assemble a proper fee schedule for the scope of work. The RFQ requirements were reviewed and initial data requests outlined. Additionally, project components were clarified and final requirements established. The role of each attendee was shared.
- <u>Contractual Scope of Work:</u> Details were established by the team based upon the initial RFQ and kick-off meeting. Subsequently the contract scope was evaluated, negotiated, and approved by the County and City.
- <u>Project Preparation:</u> Included review of prior reports, the development of a comprehensive data request, and identification and collection of current building documents, drawings, and reports. Multiple meetings were held with County and City key stakeholders at the Justice Center. These meetings established project goals, expectations, communication, organization, schedule, scope reaffirmation, and next steps.
- <u>Kick-off Activities</u>:
    - Introductory walk through of the Justice Center Complex and other buildings that house components to be included in the project analysis. The ancillary facilities outside the Justice Center Complex included the old Courthouse, the Marion Building, and Courthouse Square. The purpose of this walk-through was to familiarize the project team with the building and to perform preliminary high level observations of prevailing conditions.

- An organizational/informational meeting was held with core team members from major user groups of the facility (Public Works, Public Safety, etc.) The initial core team meeting focused on using the facilities maintenance area as a base of assessment operations, background checks, data request status, project schedule review, and next steps.
- Preparation of the facility condition assessment prioritization / categorization for documentation.
- Review of the data request made to Courts, jail, County, City, and the facility operations.
- Interviews with key facilities management staff were conducted to understand key issues, historical maintenance of the complex, need for staff support during the FCA, and purpose of other studies conducted.

**DATA REQUESTED**

There were two primary types of data requested: 1. all supporting data of the physical environment of the Justice Center Complex; and 2. data related to functioning of the Justice Center Complex. Those items included:

| | **Supporting Documentation for Facility Assessment Activities** |
|---|---|
| | Current Codes to be used in Study including Universal Accessibility Guidelines |
| | Current Capital Plans |
| | Current Work Orders or Known Issues |
| | Drawings and Project Manuals showing Justice Center Construction |
| | CAD or Revit drawings of the Justice Center, Police Building, Marion Building, and Courthouse Square |
| | Current projects by Major User Groups |
| | All past Studies, Surveys, and Reports for the Justice Center |
| | Data and Communication System Information |

We also requested significant functional data from the major user groups at the complex. The following table shows the type of information received:

| | |
|---|---|
| **Task 2 - Collect data for Courts and related functions** | |
| | Collect official population/demographic data & projections |
| | Collect historical caseloads by court/by case type |
| | Collect historical judicial FTEs by court/division (magistrates) |
| | Collect historical staffing by component |
| | Collect all organizational tables by court/component |
| | Collect all external space requirements outside Justice Center - Marion and Courthouse Square and old courthouse |
| | |
| **Task 3 - Collect data for Jail and related functions** | |
| | Collect historic booking records by crime classification and demographics |
| | Collect historic arrest records by crime classification and demographics |
| | Collect historical data on Average Daily Population by security classification and demographics |
| | Collect historical data on Average Length of Stay by security classification and demographics |
| | Collect historical data on any pre- or post trial diversion program such as Community Corrections |
| | Collect historical data on staffing |
| | |
| **Task 4 - Collect data for County and related functions** | |
| | Collect historical workloads by component (if relevant) |
| | Collect historical staffing by component |
| | Collect all organizational tables by component |
| | |
| **Task 4 CPD - Collect data for CPD and related functions** | |
| | Collect historical workloads by component (if relevant) |
| | Collect historic booking records by crime classification and demographics |
| | Collect historic arrest records by crime classification and demographics |
| | Collect historical data on Average Daily Population by security classification and demographics |
| | Collect historical data on Average Length of Stay by security classification and demographics |
| | Collect historical staffing by component |
| | |
| **Task 5 - Collect data for County Administration and related functions** | |
| | Collect historical workloads by component (if relevant) |
| | Collect historical staffing by component |
| | Collect all organizational tables by component |
| | |

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## 2.2. Data Management

Today, many Government agencies are moving toward an electronic platform in an effort to capture information in a single location. Electronic storage reduces file storage space and makes the data more readily available by integrating information into an electronic environment.

Whether the goal is archiving, document management, workflow, or simple distribution of information, a digitized document is much more useful than its original paper form. Governments that recognize how scanning can help organize, share, and protect information contained in paper documentation reap benefits such as lowered operational costs, improved security, individual productivity, and knowledge asset preservation.

Cuyahoga County and the City of Cleveland both recognize the importance of digital archiving and have included digitizing services as part of the contract specific to archiving the collected data. Given the absence of specific archiving software, all documents were archived in PDF formats, organized in file folders specific to the items scanned. Appendix A provides a listing of all scanned documents. We recommend purchasing a software system for digital archiving and facility management depending on the level of usage intended. This system should tie in with the system described in Section 2.2.2.

### 2.2.1. Scanning and Archiving

The County and City had the consultants scan and store (on DVDs) thousands of documents and drawings pertinent to the Justice Center Complex including planning and projects since its inception. Types of documents collected included:

- Paper Drawings
- AutoCAD / Revit Drawings
- Project Manuals
- Environmental Records
- Studies
- Population Trends
- Courts and Jail Data
- Utility Data for City and County
- Maintenance Data
- Quotes for Future Projects

The scans were organized by County and City departments, projects, or assets. For all non-drawing documents the files were named as noted in the document.

Each drawing was arranged as follows:

- By ownership (County or City)
- Drawing set scanned (nomenclature for each set 00x)
- Number of the drawing in the set (nomenclature for number of drawings 00x)
- Drawing numbering system matching the bottom right corner of the drawing.

Refer to Appendix A for a listing of all documents archived.

### 2.2.2. Capital Asset Management Software Considerations

Our team provided the County criteria to be considered to obtain a comprehensive enterprise solution. The team focused on an asset management software solution that could be created or adapted from one of many programs available on the market. There are several options available based upon need, usage, depth, implementation, and integration with other ERP systems. Below is the summary of criteria for a software solution:

Purpose of Software: To aid in the planning of predictive and preventative maintenance and facility capital asset replacement.

Provide a capital asset management and planning software application, either hosted by Cuyahoga County or the Vendor, for managing facilities condition information. The proposed system should be capable of accepting existing data from Cuyahoga County in addition to or in place of facilities assessment information provided by the County's Vendors. At a minimum, the asset management software system shall be a fully integrated facility condition assessment system, facility sub-element asset inventory system, and capital asset planning/replacement system that is capable of providing standard and customized management reports. At project completion, the software shall be fully loaded with all FCA data, inventory, maintenance, repair and replacement (MR&R) cost estimates with resulting recommendations for repair and replacement work moving forward over the term of a five-year period.

Provide training to County staff on the use of the capital asset management and planning software such that they will be capable to take over daily operations and perform on-going data updates.

Requirements for the Capital Asset Management Software: The Vendor should provide a software application, preferably web-based, for managing the facilities inventory and condition database. This system shall provide both tabular and graphical reports. Options for hosting shall be proposed by the Vendors. The proposed system should be capable of accepting existing baseline data and previous condition assessment data for selected buildings from County in addition to or in place of condition assessment information provided by the County's Vendors.

The facility asset management software system should support the key functional concepts and include the preferred features. The system may also have additional functionality that could be utilized by the County over time. The Vendor should provide a description of each of the following optional functions that are part of their system: templates, compliance reminders, software, maintenance protocols, mobility functions, inventory tracking, space utilization, and other offerings. Software requirements were defined to unite the current County systems and future operational considerations.

Requirements for Software Training: Requirements around system training should be established by the Vendor to teach dedicated County staff how to best utilize, maintain, and efficiently function.

GIS: Since the County already has an established GIS department that performs geospatial services for the County the Team determined it best to have the Vendor supply information relative to compatibility with the County's GIS services.

Refer to Appendix B for a complete description provided to the County supporting the RFQ process.

## 2.3. Utility Analysis

The Justice Center Complex, including the Cleveland Police Headquarters use district steam, district chilled water, electricity, and natural gas[3]. The 2012 utility cost was $4,351,698 for the Justice Center Complex and $1,164,512 for Jail II. The City of Cleveland provides water and the Northeast Ohio Regional Sewer District (NEORSD) provides sewer to all buildings.

Since its original construction, the Courts Tower, Corrections Center (Jail I), and Atrium have used district steam provided by Cleveland Thermal to meet all building heating needs. The Cleveland Police Headquarters and Jail II were originally served by steam boilers. The steam main is routed through the Parking Garage up to the 5th floor mechanical equipment room (MER) where it is distributed to the Courts Tower, Jail I, and the Cleveland Police Headquarters Building.

Originally, the Courts Tower, Atrium, and Corrections Center (Jail I) were cooled by two (2) steam absorption chillers and a steam turbine chiller installed in the penthouse mechanical equipment room (MER) of the Courts Tower. Chiller condenser heat was rejected by a four-cell cross flow cooling tower on the roof adjacent to the penthouse MER. The condenser water pumps and primary chilled water pumps serving the original cooling plant were installed in the 24th floor MER just below the penthouse MER. The original cooling plant equipment serving the Justice Center Complex was abandoned in place in 1993, when the County signed a contract to purchase chilled water from Cleveland Energy Resources, now Cleveland Thermal.

In 2002, Cuyahoga County converted Jail II to district steam and chilled water from Cleveland Thermal. The County's contract with Cleveland Thermal expires on December 31, 2013. The Cleveland Police Headquarters Building was originally served by boilers and chillers, however today it obtains chilled water and steam from Cleveland Thermal.

[3] Natural gas is used for a generator supporting the Cleveland Police Headquarters during an emergency. The generator is housed on top of Courts Tower.

## Courts Tower, Corrections Center, and Atrium Costs

| JUSTICE CENTER COMPLEX ANNUAL UTILITY COST | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Electricity (1)** | **Steam** | **Chilled Water** | **Natural Gas** | **Water** | **Sewer** | **Total Energy** | **Total Utility** |
| 2008 | $1,703,979 | $934,294 | $1,343,923 | $0 | $178,539 | $352,315 | $3,982,196 | $4,513,050 |
| 2009 | $1,812,404 | $918,912 | $1,482,832 | $0 | $194,998 | $372,809 | $4,214,148 | $4,781,955 |
| 2010 | $1,373,627 | $1,108,485 | $1,274,730 | $0 | $218,302 | $320,782 | $3,756,842 | $4,295,926 |
| 2011 | $1,237,855 | $1,110,759 | $1,352,199 | $0 | $213,485 | $333,658 | $3,700,813 | $4,247,956 |
| 2012 | $1,322,953 | $1,162,791 | $1,064,846 | $0 | $297,666 | $503,442 | $3,550,590 | $4,351,698 |
| **Average** | **$1,490,164** | **$1,047,048** | **$1,303,706** | **$0** | **$220,598** | **$376,601** | **$3,840,918** | **$4,438,117** |

(1) Includes 2008 and 2009 Jail II electricity data.

The Justice Center Complex spent $3,550,590 on energy and $4,351,698 on all utilities in 2012. The annual energy and utility costs for the Justice Center have remained relatively constant over the last 5 years.

## Jail II

| JAIL II COMPLEX ANNUAL UTILITY COST | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Electricity (1)** | **Steam** | **Chilled Water** | **Natural Gas** | **Water** | **Sewer** | **Total Energy** | **Total Utility** |
| 2008 | | $274,473 | $333,017 | $0 | $100,415 | $197,990 | $607,490 | $905,895 |
| 2009 | | $272,591 | $372,020 | $0 | $124,193 | $160,768 | $644,611 | $929,572 |
| 2010 | $177,789 | $310,480 | $244,038 | $0 | $171,444 | $263,022 | $732,307 | $1,166,773 |
| 2011 | $181,598 | $282,163 | $299,322 | $0 | $164,269 | $330,932 | $763,083 | $1,258,284 |
| 2012 | $171,334 | $273,950 | $238,293 | $0 | $204,795 | $383,331 | $683,577 | $1,271,703 |
| **Average** | **$176,907** | **$282,731** | **$297,338** | **$0** | **$153,023** | **$267,209** | **$756,976** | **$1,177,208** |

(1) Jail II electricity data for 2008 or 2009.is included in JCC.

Jail II spent $683,577 on energy and $1,271,703 on all utilities in 2012. The annual energy cost has fluctuated while overall utility costs have steadily increased over the last 5 years. This is primarily in response to increasing water and sewer costs.

Refer to Appendix C for the full Utility Analysis Report.

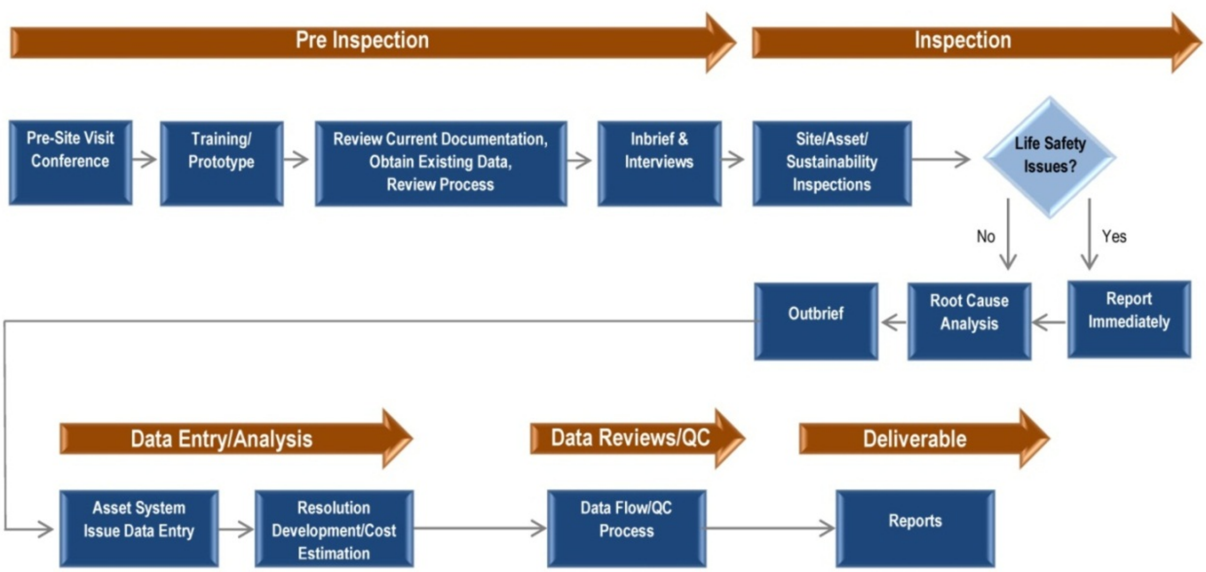
# Section 3
# Facility Condition Assessment

# 3. FACILITY CONDITION ASSESSMENT

A comprehensive review of the physical components of the Justice Center Complex was performed for this assessment. The review included a facility conditions assessment with building specialists who appraised the current building conditions, deficiencies, maintenance operations, technology, and security operations. Physical components included (but were not limited to):

- Exterior Plaza Construction
- Exterior Envelope: roof, walls, windows
- Interior Construction: walls, doors, flooring, ceilings, finishes
- HVAC Systems and Components
- Automated Building Systems
- Plumbing Systems and Components
- Electrical Systems and Components
- UPS Systems. Emergency Generators and Associated Components
- Security Systems: access controls, video cameras and monitoring
- Data and Communications Systems and Components
- Fire Alarms and Fire Protection Systems
- Vertical Circulation: escalators, service elevators, elevators

The Assessment Team developed descriptions for building components, assessed the current condition of these components, and provided recommendations for upgrades or renewals to meet generally accepted performance criteria / future demands. The graphic below represents the process undertaken by the Assessment Team.



## 3.1. Methodology

This section contains an overview of the process and methodology used by the Assessment Team. The process aligned to ASTM Standard E2018-08, "Standard Guide for Property Condition Assessment: Baseline Property Condition Assessment Process," ASTM International.

After defining the scope of the project the team worked in coordination with the County and City to ensure that all RFQ objections were being met.

- Project Kick-Off. The initial project kick-off meeting was held in May 2013 with key stakeholders from the County and City. The purpose of the meeting was to discuss overall program objectives, confirm the buildings to be evaluated, establish metrics and weightings to use in work prioritization, determine site access requirements, understand background checks, and establish stakeholders and points of contact.
- Training. A training program was developed specific to the assessment of the Justice Center Complex. This program was intended to provide the Assessment Team specific assessment procedures, site specific issues, safety practices, client interface, and analysis of building construction and techniques unique to the Justice Center Complex. Periodic training briefs were performed throughout the contract period to ensure a consistent approach to the project.
- Review of Current Documentation. All available resources were gathered, reviewed, and digitally archived. Prior to conducting site visits, assessment team reviewed provided Justice Center Complex resources, in an effort to become acquainted with existing conditions and identify issues that required specific attention prior to visiting the site. Documents reviewed included (but were not limited to): construction drawings, construction specifications, construction submittals, as-built facility drawings, work order and job order requests, planned projects, reports, and studies.
- In-Brief and Interviews. An in-brief meeting was held with the on-site point of contact, facility representatives, and County and City assigned representative(s) at the start of the site assessment. The purpose of the in-brief was to explain the scope of inspections, identify procedures for secure and/or unavailable areas to be inspected, coordinate schedules, confirm access to facilities, generally discuss the site survey process, and to gather any final missing drawings or data. The Assessment Team interviewed County and City staff to gain additional information on non-visual asset system issues and to document current and prior maintenance activities.

**SITE INSPECTION**

The Assessment Team included architects, generalist building inspectors, exterior envelope specialists, structural engineers, electrical engineers, mechanical engineers, IT Specialists, security specialists, and vertical transportation specialists. The basis for inspections was conducted under the following guidelines:

- Standards. The assessment teams used appropriate standards to review the Justice Center Complex. The standards used included best practice elements which provided reliable information about the condition assessment as outlined in ASTM Standard E2018-08. Other industry standards included but were not limited to: International Building Codes, NFPA 101: Life

Safety Code, National Electrical Code, International Plumbing Code, ANSI 117.1, Universal Design Standards, and Fire Prevention Codes.

- Building Inspections. Each real property system (sub-element) within each asset was visually inspected using non-destructive survey techniques. Destructive testing and sampling was done on the roof, building facades, plaza, and in the parking garage. Architectural, electrical and mechanical systems within each building were reviewed for type materials, current condition, year installed, Building Owner and Managers Associate (BOMA) system life expectancy, remaining life of system, operability, size, and quantity. Facility condition assessment findings and staff interview data was documented on-site using text notes, digital photography, measurement tools, and other means necessary.
- Life Safety. Any issues that impacted life safety were immediately reported to the designated facility point of contact.
- Out-Brief. When the inspections were completed, an Out-Brief was held on-site to report any additional investigation/destructive testing that were recommended, report any life safety issues not previously identified, establish contact procedures for further coordination, and to report high level findings.

## DATA ANALYSIS

During the Data Analysis phase, the results of the site-inspections, staff interviews, and County-City provided resources were compiled, analyzed, and presented as recommendations for the Justice Center Complex. Typically the resulting data included each individual building's asset/ sub-element data updated; building sub-elements inventoried and input into the Report to include units of measure, age, material type, condition, remaining life cycle, description and value. Deficiencies were identified at the sub-element level with a complete description of inspection findings for each recommended resolutions. Key areas included:

- Assets. Validated and recorded current asset-related information, including County and City provided CAD drawings (for validation and updating overall building square footages). Asset information included name, number, location, year constructed, replacement rough order of magnitude value based on RSMeansTM regional data, and detailed description if needed.
- Systems (Sub-Elements). Validated all respective system information for each asset including systems type, Uniformat II classification, current replacement value, units, quantity, estimated year installed date, description, basis of lifecycle, and estimated remaining service life. This included valuing each system indexed to calculate the Condition Index (CI) for each. Building systems were based on ASTM UNIFORMAT II Elemental Classification for Building Specifications, an industry standard for classifying building elements developed by the U.S. Department of Commerce.
- Deficiencies. Identified, recorded, prioritized, and cost estimated all deferred maintenance, deficiencies, system renewals, and life safety violations. Described associated root causes, such as physical damage, lack of maintenance, improper materials, energy inefficiency, age/excessive wear, life safety, end of useful life, etc.
- Resolutions. For each issue identified, a corrective resolution (repair, remediate, replace) was developed using RSMeans™ standard costs, non-standard costs, and the location factor index. Resolutions included name, system, recommended deadline, description of work and cost estimate. Where there were alternate resolutions for a single issue in lieu of in-kind replacement, alternative resolutions with descriptions were included.

**Definitions:** The following definitions were used to describe the items captured, developed, or calculated by the Assessment Team.

| **Term** | **Description** |
|---|---|
| Uniformat II Code | National standard for classifying building components |
| Components | Compilation of common building systems |
| Life | Estimated component or system life expectancy based on national averages |
| Install | Estimated year component or majority of components were installed |
| Quantity | Number of items measured |
| Units | Units of measure used for quantity calculation |
| ROM Value | Rough Order of Magnitude value of components |
| ROM Estimate | Rough Order of Magnitude cost estimate to resolve deficiency |
| BOMA | Building Owners and Managers Association |
| Rating | Condition rating based on 1-5 scale |
| Deficiency | Definition of component or system problem |
| Contributing Factor | Likely reason for deficiency |
| Resolution | Corrective measure recommend to resolve deficiency |
| Code | Reference to established local, regional or national building regulations |
| Life Safety | Reference to deficiencies related to occupants personal safety |
| CI | Condition Index: ROM cost estimate divided by ROM value. |
| Urgency | Recommended priority for resolving deficiency |

**Project Review Criteria:** the following condition rating table was used as a basis for the visual inspections completed by the Assessment Team. The rating table was used to ensure consistency of the reviewer’s technique and grading scale.

| RATINGS | Excellent 5 | Good 4 | Fair 3 | Poor 2 | Bad 1 |
|---|---|---|---|---|---|
| **SITE** | | | | | |
| Curb, gutter, pavement, storm water controls, special systems, stairs, ramps, sculpture | Only normal preventative maintenance required | Some minor repairs could be required. Suitable for its intended use. Compliant with code. | Visual defects. Could affect integrity or intended use. Some code compliance. | Visible settlement, structural defects; significant repairs required. | Unrepairable; replacement required. |
| **BUILDING ENVELOPE** | | | | | |
| Walls, Windows, Doors, Exterior Finishes, Caulking, Roof Covering, Openings, Gutters, Flashing, Canopies, Plaza Deck | Only normal preventative maintenance required | Sound and weatherproof. Some minor repairs could be required. | Not completely sound or weatherproof. Wear and tear visually noticeable. More minor repairs required. | Not sound or weatherproof; significant repairs required. | Unrepairable; replacement required. |
| **ARCHITECTURAL** | | | | | |
| Interior walls, windows, doors, finishes, ceilings, stairs, conveyance, fixed equipment, millwork | Only normal preventative maintenance required | Some minor repairs could be required. Suitable for its intended use. Compliant with code. | Visual defects. Could affect integrity or intended use. Some code compliance. | Significant repairs required. Not functioning as intended. Does not meet code. Poor maintenance; life expectancy reached. | Unrepairable; replacement required. |
| **STRUCTURE / PARKING** | | | | | |
| Walls, Floors, Stairwells, Loading Docks, Equipment Slabs, Framing, Roof, Projections, Mezzanines | Only normal preventative maintenance required | Some minor repairs could be required. Does not effect structural integrity or intended use. | Cracking, crazing, and/or visual defects. Could affect structural integrity or intended use. | Visible settlement, structural defects; significant repairs required. | Unrepairable; replacement required. |
| **MECHANICAL** | | | | | |
| Supply / Exhaust, Heating / Cooling Systems, Controls, Chillers, Boiler, Steam, Piping, Building Management | Only normal preventative maintenance required. Equipment rooms are neat and clean. | Some minor repairs could be required. | More minors repairs required. Some signs of corrosion, leaking, alarm indicators and poor housekeeping are obvious. | Significant repairs required. Not function as intended. Obvious poor housekeeping and maintenance practices due to excessive corrosion, leaking, or alarm indicators. Does not meet all codes. Obvious age issues and problems getting replacement parts. | Nonfunctional; system unreliable; complete replacement required. System unsafe and does not meet codes. |
| **PLUMBING** | | | | | |
| Potable / Non-potable Water Systems, Sanitary Sewer, Bathrooms, Water Treatment Systems, Booster, Pumps | Only normal preventative maintenance required | Some minor repairs could be required. Good fixture and piping appearance. No leaks. | More minor repairs required. Wear and tear noticeable | Significant repairs required. Fixtures and plumbing are obsolete. Many leaks and obvious corrosion in piping systems. | Nonfunctional; system unreliable; complete replacement required. |
| **ELECTRICAL** | | | | | |
| Wiring, service, distribution, emergency generation, life safety, lighting, branch wiring, fire alarm | Only normal preventative maintenance required | Some minor repairs could be required. | More minor repairs required. Mostly functional. | Significant repairs required. System not fully functional for building's intended use. Systems obsolete. Age issue a factor. Does not meet code. | Unrepairable; replacement required. Repair parts not available. System do not meet code and are unsafe. |
| **FIRE SUPPRESSION** | | | | | |
| Water Line, Heads, Pumps, Boosters, Connections to Fire Alarm | Only normal preventative maintenance required | Some minor repairs could be required. Good fixture and piping appearance. No leaks. | More minor repairs required. Wear and tear noticeable | Significant repairs required. Fixtures and plumbing are obsolete. Many leaks and obvious corrosion in piping systems. | Nonfunctional; system unreliable; complete replacement required. |
| **INFORMATION TECHNOLOGY** | | | | | |
| Wiring, service, distribution, security, IT, sound, data | Only normal preventative maintenance required | Some minor repairs could be required. | More minor repairs required. Mostly functional. | Significant repairs required. System not fully functional for building's intended use. Systems obsolete. Age issue a factor. Does not meet code. | Unrepairable; replacement required. Repair parts not available. System do not meet code and are unsafe. |
| **FOOD / LAUNDRY SERVICE** | | | | | |
| Equipment, Hoods, Kitchens, Laundry, Kitchenettes | Only normal preventative maintenance required | Some minor repairs could be required. Safe to use; meets all codes. | More minor repairs required. Wear and tear noticeable. Meets most codes. | Significant repairs required. Broken elements. Wear and tear excessive. | Replacement required. |
| **SECURITY** | | | | | |
| Wiring, service, distribution, security, access control, X-ray, Detection, duress, CCTV, watch tour, central control equipment | Only normal preventative maintenance required | Some minor repairs could be required. | More minor repairs required. Mostly functional. | Significant repairs required. System not fully functional for building's intended use. Systems obsolete. Age issue a factor. Does not meet code. | Unrepairable; replacement required. Repair parts not available. System do not meet code and are unsafe. |

Quality control ensures accurate, consistent, and defensible results. A rigorous in-house Quality Control/Quality Assurance (QC/QA) program was maintained. The program included standardized processes and procedures, training, ongoing "over-the-shoulder" quality control checks, as well as technical and editorial reviews of the reporting.

After data analysis was complete and the draft reports were completed, the data review/QC process was used to refine the data prior to delivery to County and City. The data was reviewed by higher levels within the project team structure, with the last review being performed by the Team's Quality Control Manager (QCM). The data was then made available, in draft state, for review by the County and City. Comments from County and City were reviewed and incorporated into the Report as appropriate.

Our quality assurance was integrated into daily work activities and includes an automated and manual review prior to finalizing input data.

## 3.2. Training

A training program was developed to provide the Assessment Team with specific assessment procedures, site specific issues, safety practices, client interface, and analysis of building construction and techniques unique to the Justice Center Complex. Periodic training briefs were performed throughout the contract period to insure a consistent approach to the project.

Training was broken into two components: 1. Safety Training; and 2. FCA Results Training. The purpose of the Safety Training was to provide Assessment Team members with the skills and knowledge to safely perform the facility assessment. The purpose of the FCA Results Training was to ensure Assessment Team members performing the on-site inspections were trained on the data input process. The entire Assessment Team participated in both trainings.

Safety Training topics:
- Safe Practices
- On-Site Safety
- Prison Safety
- Appropriate Attire
- Protection from Environment
- PPE
- Ladder Safety
- Roof
- Electricity, Steam
- On-site Injuries

The FCA Results Training topics included:
- Contractual Requirements
- Project Definitions
- FCA Template Spreadsheet
- Scoring and Categorizing Work

- Uniformat II Coding
- Assessment Schedule
- Conducting the In-Brief and Out-Brief Meetings
- Working with your Escort

Following the training sessions the Assessment Team worked in concert with the City and County to conduct the Justice Center Complex-wide facility condition assessment. The significant effort began with the development of a Logistics Plan.

Refer to Appendix D for the Safety Training program.

## 3.3. Logistics

The facility condition assessment of the Justice Center Complex required careful coordination with a multitude of facility managers, maintenance team members, County and City staff, and other Public Works staff. Given the volume of activity surrounding the assessments and the requirements of staff to participate throughout the course of the assessment, a logistics plan was developed and implemented.

On June 26, 2013, the Assessment Team presented to several key stakeholders with the City and County. The purpose of the presentation was to share the scope of the assessment, establishing expectations, and answering any questions / concerns regarding the assessment.

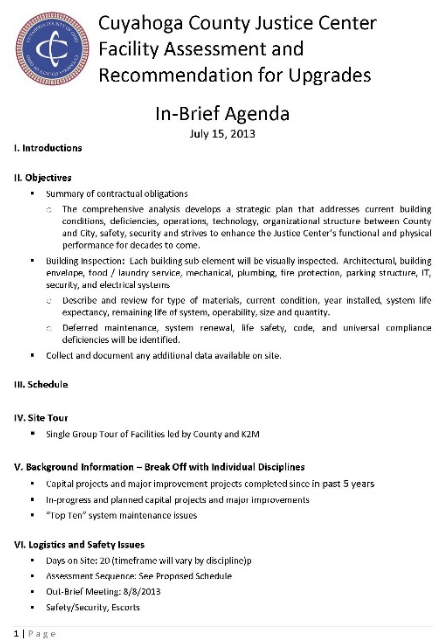
The assessment took 60 days and included: accessibility, building envelope, roof, structural, interiors, security, mechanical, plumbing, electrical, vertical transportation, fire protection, and life safety systems. These assessments were conducted by architects, engineers and building envelope specialists, roofing, and security specialists.

## 3.4. Onsite Assessment

This Section contains an overview of the facility condition assessment components completed during the actual physical assessment of the Justice Center Complex. It is important to note that the actual assessment findings are presented later in this Report.

At the start of the project and with County / City consultation, the Assessment Team leaders further defined the assessment process to ensure results were aligned with the County's and City's objectives. Accordingly, we developed the requirements of the In-Brief meeting, what building components were to be assessed, security assessment criteria, importance of understanding any life safety issues, Out-Brief meeting, and the data entry / analysis process.

- <u>In-Brief Meeting:</u> The purpose of the In-Brief Meeting was to explain the scope of inspections, to assign escort staff, identify procedures if there are secure and/or unavailable areas to be inspected, confirm access to facilities, discuss the evaluation and to gather any final missing drawings or data not previously received.
- <u>Building Systems Assessment:</u> Each building sub-element was visually inspected. Architectural, building envelope, food / laundry service, mechanical, plumbing, fire protection, parking structure, IT, security, and electrical systems will be described and reviewed for type of materials, current condition, year installed, system life expectancy, remaining life of system, operability, size and quantity. Deferred maintenance, system renewal, life safety, code, and universal compliance deficiencies were identified.
- <u>Security Assessment:</u> A specific system assessment was conducted for the overall building security. This included security on property in the atrium, courts tower, corrections center (Jail I), Jail II, and Police building. The elements of access control systems, closed circuit television (CCTV) systems, duress systems, force protection, locking controls, physical security, security hardware, visitation and arraignment systems, Watchtour systems, and other security systems were assessed. The assessment was conducted over two separate visits by the security specialist.
- <u>Life Safety:</u> For purposes of this Report there are two main categories of life safety. First, items that are non-Code compliant according to current codes. Throughout this Report there are multiple references to non-Code compliant systems, assemblies or components of this facility. Many are captured in the Top Issues document in the Appendix. Second, issues requiring immediate attention. There were a total of four items presented:



Cuyahoga County Justice Center
Facility Assessment and
Recommendation for Upgrades

In-Brief Agenda
July 15, 2013

**I. Introductions**

**II. Objectives**

- Summary of contractual obligations
  - The comprehensive analysis develops a strategic plan that addresses current building conditions, deficiencies, operations, technology, organizational structure between County and City, safety, security and strives to enhance the Justice Center's functional and physical performance for decades to come.
- Building Inspection: Each building sub-element will be visually inspected. Architectural, building envelope, food / laundry service, mechanical, plumbing, fire protection, parking structure, IT, security, and electrical systems
  - Describe and review for type of materials, current condition, year installed, system life expectancy, remaining life of system, operability, size and quantity.
  - Deferred maintenance, system renewal, life safety, code, and universal compliance deficiencies will be identified.
- Collect and document any additional data available on site.

**III. Schedule**

**IV. Site Tour**

- Single Group Tour of Facilities led by County and K2M

**V. Background Information – Break Off with Individual Disciplines**

- Capital projects and major improvement projects completed since in past 5 years
- In-progress and planned capital projects and major improvements
- "Top Ten" system maintenance issues

**VI. Logistics and Safety Issues**

- Days on Site: 20 (timeframe will vary by discipline)p
- Assessment Sequence: See Proposed Schedule
- Out-Brief Meeting: 8/8/2013
- Safety/Security, Escorts

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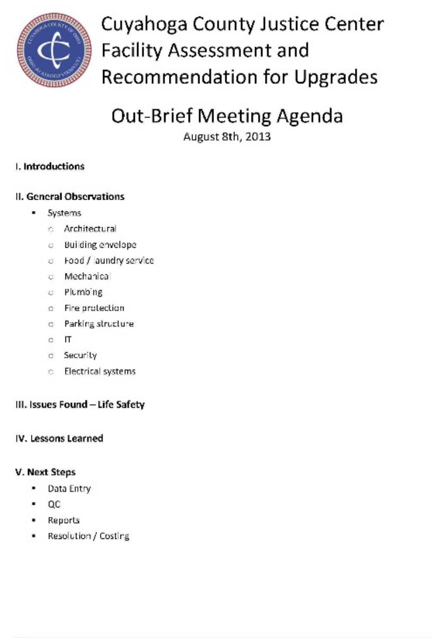

Cuyahoga County Justice Center
Facility Assessment and
Recommendation for Upgrades

Out-Brief Meeting Agenda
August 8th, 2013

**I. Introductions**

**II. General Observations**

- Systems
  - Architectural
  - Building envelope
  - Food / laundry service
  - Mechanical
  - Plumbing
  - Fire protection
  - Parking structure
  - IT
  - Security
  - Electrical systems

**III. Issues Found – Life Safety**

**IV. Lessons Learned**

**V. Next Steps**

- Data Entry
- QC
- Reports
- Resolution / Costing

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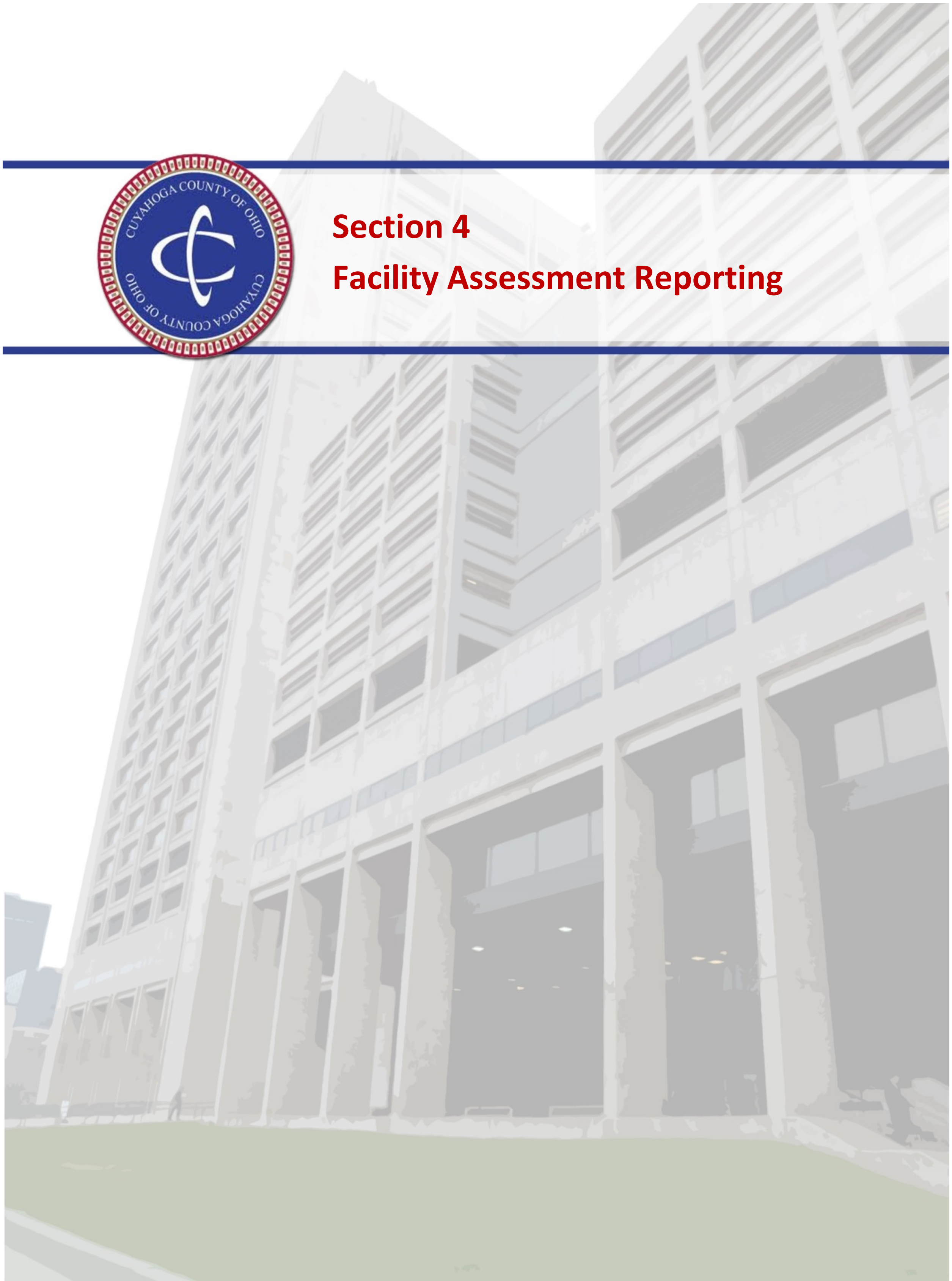
  - Flammable material stored in unit substation front aisle and behind unit substation in Jail I.
  - Granite panel cracking and crushing at upper levels of the building elevations. The west elevation of the courts tower was a specific focus.
  - Stone panels on the Police Building between the 8th and 9th floors.

  - Coping and top panels of the façade at the Police Building

At the time of this Report's release, the above life safety issues were resolved.

- Out-Brief Meeting: When the facility condition assessment was complete, an Out-Brief meeting was held on-site with all parties involved during this process to report any additional, recommended investigation/destructive testing, confirm receipt of life safety reports issues, report any new life safety problems, establish contact procedures for further coordination, and report high level findings.
- Data Entry/Analysis: The results of the site-inspection, staff interviews, and data gathered have been compiled and input into a database set up specifically for this project. Each individual building component is categorized; building sub-elements are inventoried and input into the database to include a text description, as well as units of measure, age, material type, condition, and remaining life cycle. Deficiencies are identified at the individual building element level with a complete description of inspection findings to include descriptions and cost estimates for each resolution / improvements. Refer to the subsequent sections in this Report and Appendix sections for all findings.

# Section 4
# Facility Assessment Reporting



# 4. FACILITY ASSESSMENT REPORTING

The facility conditions assessment included an assessment of the Justice Center Complex operations, physical layout, and recommendations for upgrades which will enable the buildings to function more effectively and efficiently for the next 25+ years. The facility conditions assessment was conducted by the Assessment Team of architects, engineers, and building specialists who reviewed the current building conditions, deficiencies, maintenance operations, technology, and security operations.

The Assessment Team accumulated data collected from existing documents, user and facility management interviews, site visit observations, digital photographs, and written notes. After analyzing the findings the information was compiled into a final report. The report is broken into the following sections:

- Deficiency: Narrative describing deficiencies broken down into prime systems:
  - Foundation and Structure
  - Roof system
  - Exterior systems
  - Interior Finishes
  - HVAC Systems
  - Plumbing
  - Electrical
  - Fire Protection
  - Communications
  - Security
  - Vertical Circulation
- Contributing Factor: Narrative of cause or reason for deficiency
- Resolution: Narrative of recommendation to correct or resolve deficiency

## 4.1. Lessons Learned / Best Practices

This overall assessment provided the County and City with observations, costing, lessons learned / best practices, capital plan, and suggestions for future improvements to the Justice Center Complex. The purpose of this section is to memorialize the observed lessons learned / best practices identified during the assessment. The following maintenance approaches are used in this document:

- <u>Reactive Maintenance:</u> defined as a “wait until something fails” maintenance approach. No actions or efforts are taken to maintain a component of the facility prior to failure. Based on the assessment, this approach is the most dominant approach used in the Justice Center Complex and Police Headquarters Building. This approach has a limited budget impact. We recommend continuing to use this approach; replacing those elements only as they fail.
- <u>Preventive Maintenance:</u> actions are performed on a time-based schedule. Use of the schedule detects, precludes, and/or mitigates deterioration of a component or system with the aim of sustaining, or extending an item’s useful life through controlling deterioration at an acceptable level. By performing preventive maintenance, the life of the structure may be extended closer to its full design life. This approach permits cost savings as elements are maintained and can be

used until end-of-life. We recommend preventative maintenance be used on elements nearing the end of their warranty periods, building envelope, and motorized equipment.

- Predictive Maintenance: predictive maintenance differs from preventive maintenance by basing maintenance needs on the actual condition of the structure rather than on a pre-determined schedule. The advantages of predictive maintenance include: A well-planned predictive maintenance program may nearly eliminate failures; maintenance activities can be scheduled to minimize or delete overtime cost; and Repairs can be performed and scheduled as required to support downstream maintenance. This approach can optimize operations within the structure, increasing reliability, and reduce costs. We recommend that the proactive practice of predictive maintenance be used on new elements installed in the building moving forward. The facility maintenance superintendent could be the overseer of this program to ensure its successful implementation.

Predictive maintenance is the optimum course of maintenance for any facility. Training for staff, organizational strategies, programming, and scheduling are necessary to implement predictive maintenance effectively. Predictive maintenance generally includes:

- An overview of maintenance practices
- Why a preventive maintenance program is necessary
- How to establish a preventive maintenance program
- Comparing outsourcing vs. in-house staffing
- Manual recordkeeping vs. a computerized maintenance management system
- Guide to identifying and tagging equipment and systems
- How to schedule preventative maintenance
- How much time to allow for preventive maintenance tasks
- Staff requirements to operate a facility and perform preventive maintenance
- Principles of capital planning and sample analysis
- Expected useful life of building systems
- Industry standard preventive maintenance tasks and tools
- What non-destructive preventive maintenance is and which systems it can benefit
- What predictive maintenance is and how it can save you money

A comprehensive facility maintenance program must include the following:

- Preventative Maintenance Program (PMP)
- Qualified staff performing the work
- Training of qualified staff
- Appropriate levels of staff to complete the work
- Cooperation with third-party companies with specific expertise to supplement staff
- Safety first
- Establish performance goals and metrics to measure success and justify future funding
- An administrative team to ensure the implementation of the (PMP)
- Dedicated funding to support this initiative

Refer to Appendix E for the full Lessons Learned / Best Practices document.

## 4.2. Accessibility

The Assessment Team performed an accessibility study for the Cuyahoga County Justice Center Complex (CCJC) including the Courts Tower, Jail I, Jail II, Atrium, Police Headquarters Building, and exterior site features encompassing the building. This study was based upon two primary documents: Cuyahoga County's "Universal Design Standards" (UDS) of 2004 and ANSI's A117.1-2009 which correlates with the Ohio Building Code. The accessibility portion of this report identifies physical barriers to public and employee areas of the various areas within the CCJC.

Overall, the accessibility section discusses deficiencies and resolutions at/ for the CCJC regarding accessibility, and looks at accessibility for individuals with different disabilities. The assessment took into account individuals with the following disabilities: persons who are visually impaired, hearing impaired, limited use of hands or arms, mobility impairments, persons who use wheelchairs; and persons who have a combination of various disabilities. A full, detailed accessibility study per Cuyahoga County's "Universal Design Standards" (UDS) of 2004 and ANSI's A117.1-2009 should be implemented if the County and City want to understand each individual area of non-compliance in depth. Where the UDS does not specifically address accessibility concerns, the ANSI guidelines above are used for reference.

The Justice Center routinely does not conform to current accessibility codes. However, areas which have been renovated within the past five (5) years generally conform to accessibility codes. This includes the Cuyahoga County Council chambers and the fire alarm systems through the Justice Center Complex. Deficiencies are largely a consequence of when the Justice Center Complex was designed. The Justice Center Complex was designed two decades before the first universally-recognized accessibility standards, specifically the Americans with Disabilities Act (ADA) enacted by the U.S. Congress in 1990 and the ADA Accessibility Guidelines originally published in 1991. Multiple renovations have occurred within the 40-plus year history of the CCJC; however, alterations which may have been an attempt to meet accessibility codes are either out-of-date or do not fully comply with code standards. Areas that do not conform to code requirements are discussed below.

The major systems reviewed for accessibility include:

- Interior Signage
- Mounting Heights of Controls
- Elevators
- Handrails
- Interior Accessible Ramps
- Interior Doors
- Walking Surfaces – Exterior
- Walking Surfaces – Interior
- Employee Accessible Parking
- Toilet Rooms
- Drinking Fountains
- Courtrooms
- Areas of Rescue Assistance
- Exterior Wayfinding
- Public Accessible Parking

Refer to Appendix F for the full Accessibility Report.

### 4.3. Security

R.C. Section 149.433(B)(2) - Infrastructure Record & R.C. 149.433(B)(1) Securitity Records

# R.C. Section 149.433(B)(2) - Infrastructure Record & R.C. 149.433(B)(1) Securitity Records

**CONVEYANCE**

Conveyance in the Justice Center Complex consists of multiple traction passenger elevators, traction service elevators and escalators in the Atrium building. There are passenger elevators serving the judges, low rise passenger elevators, high rise passenger elevators, service elevators, garage elevators, inmate elevators, passenger visitation elevators, and escalators which were all modernized in approximately 2002. The conveyance infrastructure currently has 20-25 years of service life remaining.

The five (5) traction elevators in Jail II and six (6) traction elevators in the Police Headquarters Building were installed in approximately 1996, and are no longer manufactured. As a result, the elevators are obsolete and have limited maintenance support available. We recommend modernizing these elevators during the full renovation of the Police Facility in Year 3-5. Costs associated with modernizing these units can be found in the capital costs listed in appendix H containing the full conveyance report.

## 4.4. Facility Descriptions:

### 4.4.1. Site / Civil

The Justice Center Complex Plaza surrounds the Complex of the facility along Ontario Street, Lakeside Avenue, West 3rd Street, and St. Clair Avenue.

Cast-in-place concrete slab-on-grade sidewalks are adjacent to the street curbs and are approximately 18 ft to 20 ft wide. These sidewalks are in keeping with the typical construction in the surrounding downtown areas.

Areas extending from the buildings to these sidewalks consist of granite pavers. Record drawings indicate approximately 2" thick pavers and a 2" sand bedding layer with a snow-melting system atop either slab-on-grade or elevated structural slab on concrete framing. The snow-melt system is discussed in the mechanical sections. The concrete frame structure provides support to the paver system. The extent of the slab-on-grade support system is unclear, as is the suitability of this system to resist reaction to heavy frost conditions.

There is a terraced plaza area between the Cleveland Police Headquarters and Jail II buildings south of the Atrium that has significantly deteriorated.

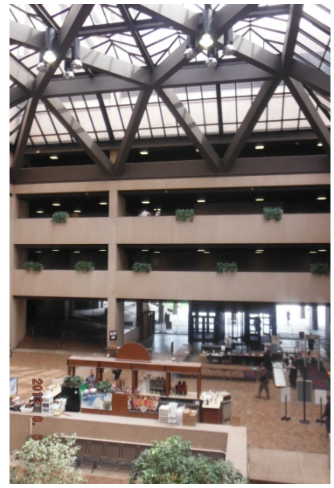
The north Atrium entrance is approached by a monumental stairway that consists of cast-in-place concrete curbs/nosings with brick paver treads. There is a cast-in-place reinforced concrete utility/pedestrian tunnel under Lakeside Avenue connecting the north wall of the Courts Tower Level P2 with the courthouse to the north.

Lawn areas bounded by curbs and/or retaining walls are located adjacent to the Jail II building along St. Clair Avenue, adjacent to the Jail 1 building along Lakeside Avenue, and adjacent to the Courts Tower building along Ontario Street and Lakeside Avenue.

There are no provisions for storm water retention on this site.

Refer to Appendix J/ Section 1 for Detailed Site/ Civil Assessment Results.

### 4.4.2. Atrium



The Atrium is a five-story structure that provides the primary public and private access points to the Justice Center Complex (JCC), and physically links the Courts Tower, Jail 1, Jail II, and Cleveland Police Headquarters at a central hub. A centrally-positioned large glass skylight with anodized aluminum framework permits natural day lighting in the Atrium's open-to-above space. The Atrium has escalators connecting the first four floors, and connecting stairs and ramps between the two first floor levels. The first floor is split into two sections: a "low-floor level" accessed from Ontario Street, and an "upper-level" accessed from Lakeside Avenue and West 3rd Street.

Multi-story curtain walls enclose the north and south faces and a single-story store front under the Cleveland Police Headquarters building encloses the east face. There is an outdoor rooftop patio with a brick paver surface. The remainder of the roof is covered by a structural space-frame system, aluminum rafter, and purlin system which supports the skylight window system. The structural components of the roof and patio areas are covered by interior ceiling systems.

The facade of the Atrium is made of granite panel veneer over concrete and concrete masonry units back-up. The granite panels are 1-1/4" thick and are fastened to 3" thick pre-cast concrete panel back-ups. These pre-cast concrete panels are fastened to the structural steel with joint sealant applied between panels for weather resistance. The exterior make-up includes widows with anodized aluminum frames.

Finishes within the Atrium consist of granite wall tile panels (primary wall finish), paint, wood paneling, and wood slat panels. Granite wall tile panels are found throughout the five-story space; wood paneling is found within the renovated Cuyahoga County Council Chambers; and wood slat panels are in the municipal courtrooms on the third floor. At each level, granite floor tile panels, brick pavers, carpet, and vinyl composite tile (VCT) comprise floor finishes. The granite panels and brick pavers exist within the five-story space at each level and are the most common finishes in the Atrium. Ceiling finishes include perforated metal ceiling tiles (only in the five-story space), splined acoustical ceiling tiles (ACT), suspended ACT, and brass metal ceiling slats. Outside of the Atrium the splined ACT (original to the CCJC) is the most common ceiling system. Brass metal ceiling slats exist on the first floor near the access point into Jail I.

R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

*Table14: Atrium Assessment Results Summary*

| Atrium | ROM VALUE | | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|---|
| A10- Foundations | $944,625 | | $0 | $0 | $0 | $0 | 0.00 |
| B10- Superstructure | $5,282,347 | | $0 | $0 | $0 | $0 | 0.00 |
| B20- Exterior Enclosure | $4,020,166 | | $263,294 | $49,702 | $0 | $1,093,329 | 0.35 |
| B30- Roofing | $1,658,077 | | $0 | $0 | $370,991 | $0 | 0.22 |
| C10- Interior Construction | $2,231,591 | | $0 | $20,948 | $0 | $1,456,612 | 0.66 |
| C20- Stairs | $269,423 | | $0 | $0 | $0 | $20,672 | 0.08 |
| C30- Interior Finishes | $3,120,847 | | $28,803 | $663,835 | $0 | $1,573,229 | 0.73 |
| D10- Conveying | $4,341,094 | | $3,445 | $248,063 | $0 | $0 | 0.06 |
| D20- Plumbing | $1,039,181 | | $0 | $0 | $0 | $413,438 | 0.40 |
| D30- HVAC | $5,637,510 | | $551,250 | $0 | $0 | $2,067,188 | 0.46 |
| D40- Fire Protection | $1,183,877 | | $0 | $0 | $0 | $1,183,877 | 1.00 |
| D50- Electrical | $5,452,852 | | $34,453 | $471,237 | $0 | $2,826,602 | 0.61 |
| E- Equipment/Jail | $786,358 | | $0 | $0 | $0 | $0 | 0.00 |
| Sub-Total | **$35,967,947** | | **$881,245** | **$1,453,784** | **$370,991** | **$10,634,945** | **0.37** |

Refer to Appendix J/ Section 2 for Detailed Atrium Assessment Results.

### 4.4.3. Courts Tower

The Courts Tower is a 26-story structure that includes two lower level private parking garages: Parking Level 1 and Parking Level 2 (PK-1 and PK-2). General access to Courts Tower is through the public Atrium or via elevators from the parking garages. Floors 1 through 4 and floors 6 through 11 include administrative space for the court system and other County administrative space. The 5th and 24th floors are mechanical spaces with an [redacted] 149.433(B)(1) Securitity Records [redacted] Floors 12 through 23 are primarily courtroom floors containing courtrooms. Two banks of passenger elevators serve Courts Tower; one services up to the 11th floor and the other through the 23rd floor.

The Courts Tower building consists of a 26-story structural steel frame structure over a 2-story underground reinforced concrete frame parking structure. The structural steel framing system consists of lateral force resisting moment frames in two directions. The elevator shafts are constructed of concrete masonry units (CMU). The remainder of the interior walls are partitions only and are not load bearing. All structural steel is enveloped in spray-applied fireproofing material. Due to interior and exterior finishes the structural steel framing was not accessible for observation in the majority of the building. It is assumed that framing is in similar condition as that accessible on the 5th floor mechanical spaces. The below grade cast-in-place reinforced concrete framing system consists of monolithically constructed slab, joists, beams, and columns. The lowest parking level traffic surface is slab-on-grade and is independent of the building structure. The concrete framing which supports Levels P1 and Plaza is accessible to observation except for minor areas at stairways and storage rooms.

The upper Courts Tower roof is approximately 6,436 square feet. The roof surface includes 24"X 24" pre-cast concrete pavers set on leveling shims above a protective mat over two layers of 2" thick insulation board. A second protective mat, drainage screen, and slip sheet also cover the Hydrotech Monolithic Membrane 6125 waterproofing membrane system. The Hydrotech membrane is hot applied, rubberized asphalt that is mopped onto the primed concrete deck. The middle roof is approximately 1,342 square feet. This roof is of the same construction as the upper and lower roof. The lower roof is approximately 19,478 square feet. A 2nd floor roof area measures approximately 4,697 square feet with one main roof area. This roof system is gravel surfaced Coal Tar BUR (built up roof) membrane applied over perlite insulation mopped to a concrete deck.

The building façade of Courts Tower consists of granite panel veneer over concrete and CMU back-up. Exterior finishes include window units with anodized aluminum frames.

Interior finishes within Courts Tower consists of: painted drywall (primary wall finish), granite wall tile panels, painted metal panels, and wood slat panels. Granite wall tile panels exist only on the Atrium floors adjacent to the Atrium space. Painted metal panels were implemented at Courts Tower elevator bank lobbies, including the judge and jury elevator bank. Wood slat panels are used extensively within the courtrooms and corridor/waiting areas outside of the courtrooms. Ceiling finishes primarily include splined acoustical ceiling tiles (ACT) with some ACT within a suspended grid system. Floor finishes include carpet (primary floor finish), vinyl composite tile (VCT), granite floor tile panels, and brick pavers. Granite floor tile panels and brick pavers are located in elevator lobbies and adjacent to the Atrium.

R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

**R.C. Section 149.433(B)(2) - Infrastructure Record**

*Table 15: Courts Tower Assessment Results Summary*

| Courts Tower | ROM VALUE | | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|---|
| A10- Foundations | $1,472,738 | | $0 | $0 | $0 | $0 | 0.00 |
| B10- Superstructure | $26,012,720 | | $0 | $1,674,422 | $1,674,422 | $0 | 0.13 |
| B20- Exterior Enclosure | $32,907,423 | | $5,005,626 | $255,584 | $0 | $6,399,143 | 0.35 |
| B30- Roofing | $2,255,095 | | $0 | $2,255,095 | $0 | $0 | 1.00 |
| C10- Interior Construction | $14,810,820 | | $0 | $1,320,657 | $4,726,290 | $4,926,263 | 0.74 |
| C20- Stairs | $1,584,844 | | $0 | $0 | $0 | $68,906 | 0.04 |
| C30- Interior Finishes | $8,221,101 | | $0 | $750,087 | $3,725,740 | $3,745,274 | 1.00 |
| D10- Conveying | $5,650,313 | | $0 | $1,240,313 | $0 | $0 | 0.22 |
| D20- Plumbing | $5,117,408 | | $0 | $0 | $2,348,499 | $2,210,687 | 0.89 |
| D30- HVAC | $27,761,708 | | $0 | $13,880,854 | $6,940,427 | $6,940,427 | 1.00 |
| D40- Fire Protection | $5,829,959 | | $0 | $42,722 | $0 | $0 | 0.01 |
| D50- Electrical | $27,610,098 | | $0 | $4,266,974 | $8,143,897 | $8,316,163 | 0.75 |
| E- Equipment/Jail | $29,768 | | $0 | $0 | $0 | $0 | 0.00 |
| Garage | $11,025,000 | | $0 | $2,401,383 | $2,401,383 | $0 | 0.44 |
| **Sub-Total** | **$170,288,993** | | **$5,005,626** | **$28,088,090** | **$29,960,658** | **$32,606,863** | **0.56** |

Refer to Appendix J/ Section 3 for Detailed Courts Tower Assessment Results.

### 4.4.4. Corrections Center (Jail I)

The Corrections Center (Jail I) is a 10-story structure including two lower level private parking garages: Parking Level 1 and Parking Level 2 (PK-1 and PK-2).

The Jail I building is made up ofa structural steel frame over a 2-story underground reinforced concrete frame parking structure. The structural steel framing system consists of lateral force resisting moment frames in two directions. The elevator shafts are constructed of concrete masonry units (cmu) and are not considered as lateral shear walls. The remainder of the interior walls are partitions only and are not load bearing walls. All structural steel is enveloped in spray-applied fireproofing material.

The below grade cast-in-place reinforced concrete framing system consists of monolithically constructed slab, joists, beams and columns. The lowest parking level traffic surface is slab-on-grade independent of the building structure. The concrete framing that supports Levels P1 and 1 is accessible for observation except for minor areas at stairways and storage rooms. It is assumed that framing in these areas is similar in condition to those areas that are accessible.

The exterior of the building is clad in precast concrete panels with pink granite veneer and wrap around window systems. The roof of the structure is metal roof deck covered by rigid insulation and a membrane roofing system with pavers for ballast.

The north and south wings of the roof are 22,701 square feet each. The roof surface is covered with 24"X 24" pre-cast concrete pavers set on leveling shims on top of a protective mat over 4" thick insulation board. A second protective mat, drainage screen, and slip sheet also cover the Hydrotech Monolithic Membrane 6125 waterproofing membrane system. The Hydrotech membrane is hot applied rubberized asphalt that is mopped onto the primed concrete deck.

The penthouse roof is 6,174 square feet in area. The roof surface is covered with 24"X 24" pre-cast concrete pavers set on leveling shims on top of a protective mat over two layers of 2" thick insulation board. A second protective mat, drainage screen and slip sheet also cover the Hydrotech Monolithic Membrane 6125 waterproofing membrane system. The Hydrotech membrane is hot applied rubberized asphalt that is mopped onto the primed concrete deck.

There are six (6) lower canopy roofs surrounding Jail I. The roof surfaces are covered with 24"X 24" pre-cast concrete pavers set on leveling shims on top of a protective mat over two layers of 2" thick insulation board. A second protective mat, drainage screen and slip sheet also cover the Hydrotech Monolithic Membrane 6125 waterproofing membrane system. The Hydrotech membrane is hot applied rubberized asphalt that is mopped onto the primed concrete deck.

General access to Jail I is through the public Atrium, or via elevators and stairwells in the parking garages. Elevators are provided on PK-1 primarily for transfer of inmates from the sallyport to the booking area. Stairwells connect the County Sherriff Department's parking garage (PK-2) and Parking Level 1 (PK-1) to the first floor of Jail I. The 1st floor – comprised mainly of a large hallway that connects multiple uses for Jail I (including visitation, security entrance to the Jail I, etc.), a female locker room for the County Sheriff's Department, and miscellaneous office space for different departments. Two exterior entrances can be used to access Jail I; one to/from West 3rd Street (no longer used as a public entrance) and the other leading to/from Lakeside Avenue. The remaining floors include miscellaneous office space for multiple departments, County inmate pods, dayrooms and cells, Municipal holding cells, booking area, and a mechanical floor.

Wall finishes within Jail I consist of: paint (primary wall finish) and some granite wall tile panels located on the first floor only. Ceiling finishes include a brass metal ceiling slat system (only on the 1st floor at the main hallway), suspended acoustical ceiling tiles (ACT), splined ACT, and gypsum board. Floor finishes include carpet (primary in office areas), vinyl composite tile (VCT), ceramic tile (primarily in bathrooms), and painted concrete (primarily located throughout the detention areas).

R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

*Table 156: Jail I Assessment Results Summary*

| Jail I | ROM VALUE | | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|---|
| A10- Foundations | $710,167 | | $0 | $0 | $0 | $0 | 0.00 |
| B10- Superstructure | $14,750,220 | | $0 | $1,639,969 | $819,984 | $0 | 0.17 |
| B20- Exterior Enclosure | $13,682,367 | | $2,745,875 | $381,812 | $0 | $4,658,250 | 0.57 |
| B30- Roofing | $5,912,508 | | $0 | $5,912,508 | $0 | $0 | 1.00 |
| C10- Interior Construction | $11,613,303 | | $0 | $97,433 | $1,204,887 | $2,586,249 | 0.33 |
| C20- Stairs | $792,422 | | $0 | $0 | $0 | $34,453 | 0.04 |
| C30- Interior Finishes | $2,082,740 | | $0 | $796,420 | $971,697 | $314,624 | 1.00 |
| D10- Conveying | $3,789,844 | | $0 | $744,188 | $0 | $0 | 0.20 |
| D20- Plumbing | $2,901,769 | | $0 | $140,628 | $863,325 | $351,571 | 0.47 |
| D30- HVAC | $15,741,964 | | $137,813 | $1,574,196 | $13,030,172 | $0 | 0.94 |
| D40- Fire Protection | $3,305,812 | | $8,269 | $10,336 | $0 | $0 | 0.01 |
| D50- Electrical | $16,214,966 | | $0 | $3,197,477 | $3,612,781 | $2,161,895 | 0.55 |
| E- Equipment/Jail | $26,618,967 | | $0 | $0 | $3,445,313 | $3,445,313 | 0.26 |
| E- Garage | $6,752,813 | | $0 | $2,076,490 | $2,076,490 | $0 | 0.62 |
| **Sub-Total** | **$124,869,860** | | **$2,891,957** | **$16,571,457** | **$26,024,648** | **$13,552,355** | **0.47** |

Refer to Appendix J/ Section 4 for Detailed Jail I Assessment Results.

### 4.4.5. Jail II

The Jail II building is made up of a nine-story structural steel frame structure on top of a one-story underground reinforced concrete basement structure. The structural steel framing system consists of lateral force resisting moment frames in two directions. The elevator shafts are constructed of concrete masonry units (cmu) and are not considered as lateral shear walls. The remainder of the interior walls are partitions only and are not load bearing walls. All structural steel is enveloped in spray-applied fireproofing material, The below grade cast-in-place reinforced concrete framing system consists of monolithically constructed walls. There is no parking level in this structure.

The exterior of the building is covered in precast concrete panels with granite veneer and punched opening anodized aluminum window systems.

General access to Jail II is through the public Atrium. The 1st floor is under renovation and when completed will be used for visitor entrance to Jail II, a male locker room for the County Sheriff's Department, and a new commercial kitchen and storage area to serve both Jail I and II. There are multiple egress exits from the stairwells to the exterior, all of which are secured and an employee entrance located on West 3rd Street for County personnel only. The only means of entrance for the public is from the Atrium space. The remaining floors consist of County inmate pods (two story high pods with internal access to the second floor of cells), dayrooms and cells, and a mechanical floor. The 4th floor also has a sky bridge that connects to Jail I.

The main Jail II roof is approximately 24,411 square feet with a 1,758 sq. ft. loading dock on the lower east side of the main building. Total roof area is approximately 26,170 square feet.

The building has one main roof section with one raised penthouse roof section and seven (7) small lower eyebrow roofs. A fully adhered 045 MIL FR EPDM insulated roof system is installed on all ten (10) roof sections. The membrane is stamped indicating that the roof membrane was manufactured in 1987, 1988, and 1992. It is understood that this membrane is the original roof system. Tapered insulation is used to provide positive slope on all roof areas which is mechanically fastened to the concrete deck substrate. Drainage is provided by interior roof drains. The 24 "x 24"pre-cast concrete pavers are assisting to keep the membrane in place.

Wall finishes within Jail II include: paint (primary wall finish), a minor amount of ceramic tile (located in the locker room), and some granite wall tile panels (located on the first floor only). Ceiling finishes include suspended acoustical ceiling tile systems (ACT – located in the two story pods and locker rooms) and gypsum board. The new commercial kitchen area will contain a metal panel security ceiling along with gypsum board ceilings when completed. Floor finishes vinyl composite tile (VCT), ceramic tile (primarily in the locker room), and painted concrete (located throughout all of the detention areas). The new kitchen area will consist of quarry tile and sealed concrete areas (this area was under construction during the site visit).

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

*Table 167: Jail II Assessment Results Summary*

| **Jail II** | **ROM VALUE** | | **Year 1** | **Year 2-4** | **Year 5-8** | **Year 9-12** | **CI** |
|---|---|---|---|---|---|---|---|
| A10- Foundations | $711,572 | | $0 | $0 | $10,336 | $0 | 0.01 |
| B10- Superstructure | $8,771,267 | | $0 | $0 | $10,680 | $0 | 0.00 |
| B20- Exterior Enclosure | $7,792,006 | | $0 | $0 | $798,152 | $93,386 | 0.11 |
| B30- Roofing | $612,838 | | $0 | $612,838 | $0 | $0 | 1.00 |
| C10- Interior Construction | $4,475,392 | | $0 | $70,284 | $168,131 | $71,767 | 0.07 |
| C20- Stairs | $2,662,538 | | $0 | $0 | $0 | $41,344 | 0.02 |
| C30- Interior Finishes | $922,909 | | $0 | $361,818 | $305,186 | $85,905 | 0.82 |
| D10- Conveying | $1,584,844 | | $1,584,844 | $0 | $0 | $0 | 1.00 |
| D20- Plumbing | $1,725,546 | | $0 | $241,172 | $0 | $0 | 0.14 |
| D30- HVAC | $9,361,011 | | $34,453 | $819,984 | $0 | $5,030,156 | 0.63 |
| D40- Fire Protection | $1,965,812 | | $0 | $27,563 | $0 | $0 | 0.01 |
| D50- Electrical | $9,659,600 | | $0 | $654,609 | $751,078 | $1,326,780 | 0.28 |
| E- Equipment/Jail | $15,586,387 | | $155,864 | $311,728 | $779,319 | $779,319 | 0.13 |
| E- Garage | $0 | | $0 | $0 | $0 | $0 | 0.00 |
| **Sub-Total** | **$65,831,721** | | **$1,775,161** | **$3,099,997** | **$2,822,883** | **$7,428,658** | **0.23** |

Refer to Appendix J/ Section 5 for detailed Jail II Assessment Results.

### 4.4.6. Cleveland Metropolitan Police Headquarters (Police Building)

The Police Building is a 9-story structure including two lower level private parking garages: Parking Level 1 and Parking Level 2 (PK-1 and PK-2). General access to the Police Building is through the public Atrium, or via elevators in the parking garages. The 1st floor – comprised mainly of a large lobby with stand-alone control desk - no longer functions as a gathering space since functions previously held in the lobby have moved to other buildings operated by the Cleveland Police Department. In addition to the lobby, there is a Cleveland Police Museum on the first floor adjacent to the main elevator lobby. Two exterior entrances – one off of Ontario Street and the other leading to/ from a courtyard are no longer used as access points for security purposes. The remaining floors consist of Cleveland Police administrative offices, detective offices, temporary holding cells (6th floor), evidence storage, and other general police activity spaces.

The Police Building consists of a 9-story structural steel frame structure on top of a 2-story underground reinforced concrete frame parking structure. The structural steel framing system consists of lateral force resisting moment frames in two directions. The elevator shafts are constructed of concrete masonry units (cmu) and are not considered as lateral shear walls. The remainder of the interior walls are partitions only and are not load bearing walls. All structural steel is enveloped in spray-applied fireproofing material. The below grade cast-in-place reinforced concrete framing system consists of monolithically constructed slab, joists, beams and columns. The lowest parking level traffic surface is slab-on-grade independent of the building structure. In or about the year 2000 extensive concrete restoration was performed and these repairs are still in very good condition. The concrete framing supporting Levels P1 and the Plaza is accessible to observation except for minor areas at stairways and storage rooms. It is assumed that framing in these areas is in similar condition to accessible areas.

The main building roof is approximately 35,224 square feet with one primary roof area and three penthouse roofs, which are included in the total square footage. The primary roof is an asphalt applied granular surface modified bitumen roof system installed over a layer of 15/16 inch thick fiberglass insulation over a layer of 1.5 inch isocyanurate insulation, all mopped to a concrete deck.

The façade of the Police Building is covered in precast concrete panels with pink granite veneer, and wrap around window systems concrete, and concrete masonry unit (CMU) back-up.

Wall finishes within the Police Building include: paint (primary wall finish), granite wall tile panels, cork board wall covering, and metal panel column covers. Granite wall tile panels, cork board wall covering, metal panel column covers, and a large woven tapestry which covers a large portion of wall space exist on the first floor. Ceiling finishes include perforated suspended metal egg-crate ceiling systems (only on the 1st floor at the lobby); splined acoustical ceiling tiles (ACT), and suspended ACT. Splined ACT is the most common ceiling system at the Police Building. Floor finishes include carpet (primary floor finish), vinyl composite tile (VCT), granite floor tile panels, and brick pavers; granite floor tile panels and brick pavers are located on the first floor.

R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

*Table 17: Cleveland Metropolitan Police Headquarters (Police Building) Assessment Results Summary*

| CMPH | ROM VALUE | | Year 1 | Year 2-4 | Year 5-8 | Year 9-12 | CI |
|---|---|---|---|---|---|---|---|
| A10- Foundations | $920,748 | | $0 | $0 | $0 | $0 | 0.00 |
| B10- Superstructure | $10,459,555 | | $0 | $3,501,430 | $0 | $0 | 0.33 |
| B20- Exterior Enclosure | $12,550,386 | | $461,391 | $4,172,814 | $0 | $2,431,309 | 0.56 |
| B30- Roofing | $1,456,292 | | $0 | $1,456,292 | $0 | $0 | 1.00 |
| C10- Interior Construction | $4,951,303 | | $0 | $4,434,506 | $0 | $0 | 0.90 |
| C20- Stairs | $269,423 | | $0 | $0 | $0 | $44,100 | 0.16 |
| C30- Interior Finishes | $2,660,740 | | $0 | $2,660,739 | $0 | $0 | 1.00 |
| D10- Conveying | $1,901,813 | | $0 | $1,901,813 | $0 | $0 | 1.00 |
| D20- Plumbing | $2,057,678 | | $0 | $2,057,678 | $0 | $0 | 1.00 |
| D30- HVAC | $11,162,813 | | $0 | $11,162,813 | $0 | $0 | 1.00 |
| D40- Fire Protection | $2,344,191 | | $0 | $2,344,191 | $0 | $0 | 1.00 |
| D50- Electrical | $10,755,301 | | $0 | $10,712,579 | $0 | $0 | 1.00 |
| E- Equipment/Jail | $651,164 | | $0 | $206,719 | $0 | $0 | 0.32 |
| E- Garage | $11,472,891 | | $0 | $5,329,781 | $210,853 | $144,703 | 0.00 |
| **Sub-Total** | **$73,614,297** | | **$461,391** | **$49,941,354** | **$210,853** | **$2,620,112** | **0.72** |

Refer to Appendix J/ Section 6 for Detailed Police Building Results.

## 4.5. Top Issues

In anticipation of the significant expenditure required to renovate the Justice Center Complex, Cuyahoga County requested preparation of a "Top Issues List" of recommended repairs / maintenance for the Justice Center Complex. We have based our Top Issues recommendation list on urgent repair need without consideration of budget constraints.

For the purposes of this section, the following maintenance definitions will be used:

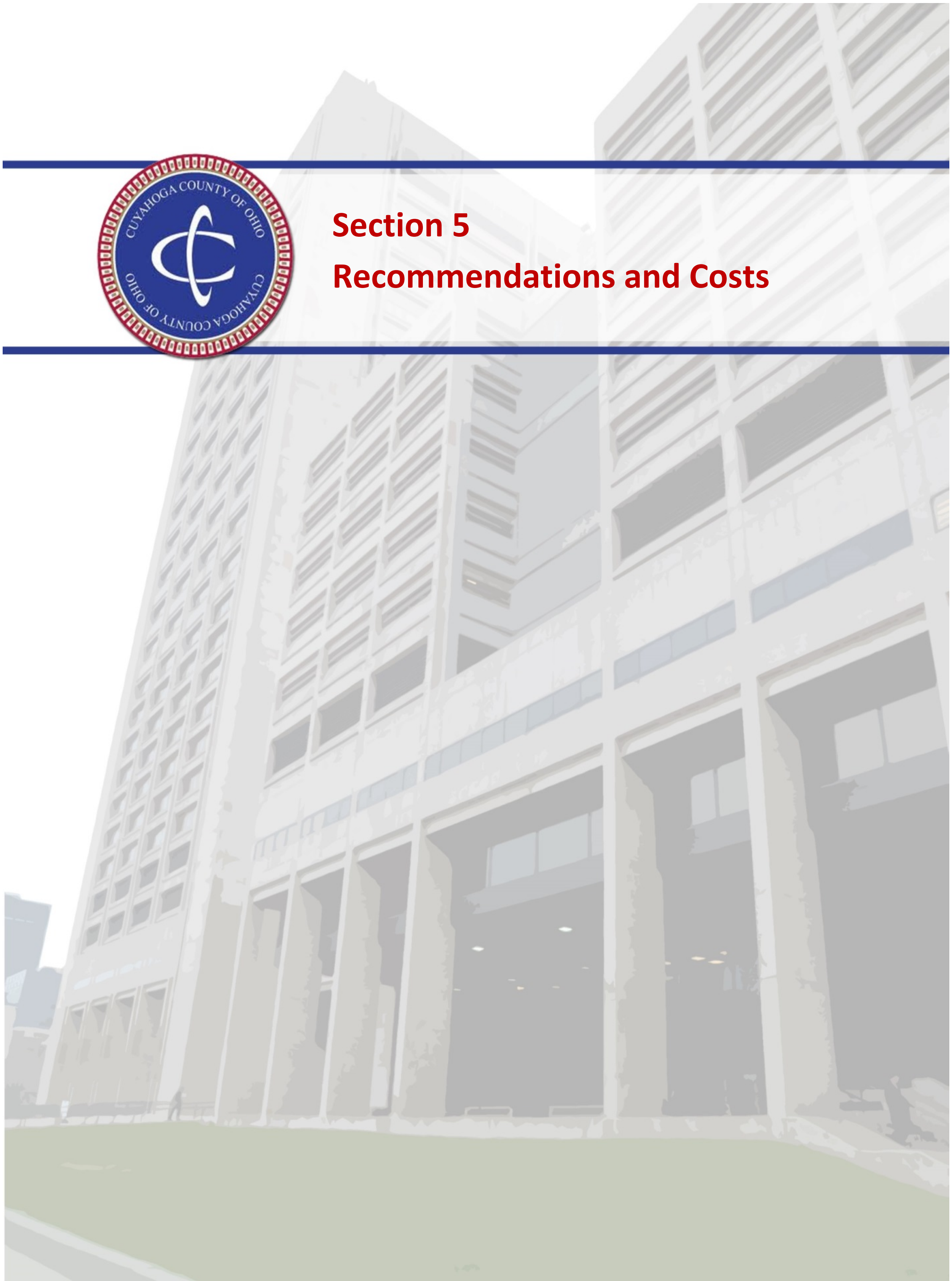
- <u>Routine Maintenance</u>: funded through the annual operating budget: maintenance needed to preserve the facilities and system components from failure or deterioration. Routine maintenance is largely provided by onsite staff or on-call vendors.
- <u>Major Maintenance</u>: primarily funded through County / City maintenance reserves, repair and renewal reserves (only in auxiliary units currently), or capital outlay projects. Consists of major repairs of maintenance deficiencies that can be accomplished without major disruption to occupants and systems, generally cost is less than $1 million.
- <u>Building Renewal:</u> primarily funded through capital outlay projects, County/City maintenance reserve funds, or repair and renewal reserves (only in auxiliary units currently), can address maintenance deficiencies. However, these differ from major maintenance as they typically focus on larger systems renewal, ADA compliance, building code compliance, life safety improvements, and environmental compliance.

The Assessment Team also prepared the following thoughts relative to the work that should occur in FY2014. The approach taken was to resolve core life safety issues that will not otherwise be addressed with the interior building modifications (programmatic changes), to address key maintenance issues that exacerbate degradation on the building interior, and resolve critical challenges to the secure nature of the building. The following twelve (12) items could be addressed:

1. <u>Atrium Smoke Control:</u> Atrium lacks a smoke removal system. Ohio Building Code (OBC) 2011-404.5 requires a smoke control system designed per OBC-909 since the Atrium connects more than two stories. Install a smoke control system to improve the life safety aspects of the building.
2. <u>Fire Dampers:</u> Option A is to do the main trunks that would likely stay in place even in a system replacement and Option B is to find them all and test.
3. <u>All Parking Garages:</u> Carbon monoxide sensors do not function properly and the ventilation system is typically turned off manually. Repair or replace sensors so they function as intended. Replace existing heating & ventilating units serving the Corrections Garage.
4. <u>Exit signage:</u> The work includes resolving inadequate signage and resolving signage pointing in the wrong direction throughout the justice center complex. The information below represents 50 new signs will be required and 20 signs will need to be replaced. All signs are estimated as L.E.D. standard, double face, ceiling or wall mounted units.
5. <u>Keying:</u> Institute a key management system that is physically checked against each lock. This should resolve potential for security breach, ensure access to doors by appropriate parties, and adequately allow exiting in an emergency. It is highly likely that some locks / cylinders will need to be replaced, key storage boxes installed, and multiple keys created. A Door Hardware Consultant should be hired to assist the County in developing a proper management system.

6. <u>Fire Protection – Jail I:</u> Unprotected floor to floor stairs in Jail(s) compromise the fire rating. Stairs should be enclosed or smoke barriers and water curtains installed.
7. <u>Fire Protection:</u> The compactor room being installed in the Corrections Center (Jail I) building should have a sprinkler system run to this space given its anticipated use. While this is not required by the building code we do believe it is prudent given the potential of fire.
8. <u>$4^{th}$ Floor Windows:</u> For the original Justice Center buildings (Courts, Atrium, and Corrections Center) we recommend replacing the glazing, frames, head flashing, and all sealant at the $4^{th}$ Floor only. We are limiting this work to the $4^{th}$ floor given the potential FY14 budget and understanding these windows need to be replaced immediately. A benefit to performing this limited work is the ability to refine the technique for replacing windows in advance of the future Justice Center –wide exterior window replacement projects required within the next (5) years.
9. <u>Courts Tower Sealant Replacement:</u> All of the exterior sealant applications at the Justice Center are past their useful life and are failing. We recommend replacing all building sealants including sealant at wall panels, louvers, windows, curtain wall, doors, and building envelope penetrations
10. <u>Courts Tower Wall Panel Sealer:</u> There are current stone spalls and cracks that require repairs at this time. There are also granite panels that are exhibiting cupping or warping that requires repairs. Once the repairs are complete and the granite is washed to remove the built up environmental contaminants and dirt, a clear stone water repellent should be applied to delay further warping of the granite panels. Note: when the windows are replaced we recommend a re-application.
11. <u>ADA Parking:</u> In total there are (24) accessible parking spaces located in the county owned parking garages at the Justice Center. We recommend these spaces only be used by County employees. New accommodations for public parking should be created at the plaza level on Ontario given its proximity to the “most accessible” building entrance point. Twelve (12) additional spaces should be provided. Modification to the sidewalk (curbing and pavement) and structure over the underground parking area (waterproofing, landscape, and structure) will be required. The cost estimate to perform this work is similar to those anticipated for “structured” parking given the fact that work is not on grade.
12. <u>Perimeter Security:</u> The first component includes the Installation of two pre-assembled security buildings at the garage entrances on Lakeside and West $3^{rd}$ Street. A drop gate should be installed on the entrance lane at each building location. The guards who are located inside the parking area will be stationed in these buildings (a procedure will need developed for relieving the guards). The second component requires modifying the exterior sidewalk and closing the street lane on W3rd Street to create a staging area for contractors and deliveries. This enables vehicle inspection to occur prior to them entering the building and limits the need for non-employee vehicles and people to enter the secure garage. Lastly we recommend two new 36-inch+ magnetometers (walk thru metal detectors) replacing the existing 30-inch units at the two entrances to the Justice Center. The new units provide a greater level of scanning and are ADA compliant.

Refer to Appendix K for the Top Issues List.



# Section 5
# Recommendations and Costs

# 5. RECOMMENDATIONS AND COSTS

## 5.1. Sustainable Design

The purpose of this Section is to describe potential sustainable measures that can be implemented at the Justice Center complex. Sustainability is the capacity to endure and is not tied exclusively to "environmentally friendly" products and practices. Restoration, renovation and maintenance of an existing structure to prolong its service life is sustaining the structure. Ensuring that the products and practices selected offer the lowest impact to the environment is sustainably responsible. For building modernization and interior renovation projects we recommend projects being designed and constructed to LEED Silver levels at a minimum. The following is a summary of potential sustainable best practices from the LEED v2009 Existing Buildings Operation and Maintenance (EBOM) rating system that we recommend the County and City consider as a guide for future renovations.

**BUILDING EXTERIOR AND HARDSCAPE MANAGEMENT PLAN**
Develop and use a low-impact site and green building exterior management plan that addresses building exterior and hardscape. Plan must address overall site management, chemicals, maintenance equipment, snow and ice removal, cleaning of building exterior, paints and sealants on building exterior and hardscape cleaning. Include green cleaning and maintenance practices, materials that minimize environmental impacts, replace conventional gas-powered machinery with electric-powered equivalents (either battery or corded).

Pros:
- Environmentally friendly

Cons:
- Potential higher cost
- Potential availability issues
- Most environmentally friendly alternative may not be the most effective

**INTEGRATED PEST MANAGEMENT, EROSION CONTROL AND LANDSCAPE MANAGEMENT PLAN**
Develop and use a low-impact site and green building exterior management plan that addresses the site's natural components, including overall site management, chemicals, fertilizers, landscape waste, and pest management. Include green landscape practices to reduce the use of power equipment and improve storm water control.

- Outdoor Integrated Pest Management. Address outdoor pest management in a way that protects human health and the surrounding environment by using the least-toxic chemical pesticides, minimum use of chemicals, use only in targeted locations and use only for targeted species.
- Erosion and Sedimentation Control. Address ongoing landscape operations (where applicable) and future construction activity. Reduce use of chemical fertilizers by using locally adapted plants.

Pros:
- Environmentally friendly

Cons:
- Potential higher cost
- Potential availability issues
- Most environmentally friendly alternative may not be the most effective

**WATER EFFICIENCY, PLUMBING FIXTURES**

Reduce potable water consumption by utilizing low-flow plumbing fixtures such as pint flush urinals; 1.28 gpf water closets; dual flush water closets; 0.5 gpm lavatories; 0.25 gpc metered lavatories; 1.8 gpm sinks and 1.8 gpm showers.

Pros:
- Environmentally friendly
- Reduced water consumption
- Reduced water and sewer utility cost

Cons:
- First cost of new plumbing fixtures
- Potential for increased blockages with reduced water flow in existing sanitary piping

**OPTIMIZE ENERGY EFFICIENCY PERFORMANCE**

Achieve an increased level of operating energy efficiency performance relative to typical buildings of similar type. Achieve an Energy Star rating of at least 69 using Energy Star's Portfolio Manager to implement ECMs that reduce energy cost so it is at least 10% less energy than the ASHRAE 90.1-2007 baseline building. Energy conservation measures to consider include: building envelope upgrades, lighting replacement & layout optimization, HVAC equipment and controls replacement, conversion of constant flow fans and pumps to variable flow, and removal of induction system.

Pros:
- Environmentally friendly
- Reduced energy consumption
- Reduced energy cost
- Reduced maintenance cost of new, more efficient HVAC equipment, building envelope upgrades and lighting
- Improved comfort for building envelope and HVAC control upgrades
- Improved air quality for HVAC control and air distribution upgrades
- Reduced first cost of central HVAC equipment in conjunction with upgrades to building envelope and lighting

Cons:
- First cost of energy upgrades
- Disruption of building operation

The envelopes of all five buildings have current restoration and maintenance needs that should be addressed. The products and systems used to maintain or restore the building envelopes should be selected to ensure long-term effectiveness, VOC regulation compliance, and support preventative maintenance requirements during the service life.

**FAÇADE:**

In order to sustain the façade of a building it is important to choose products that are environmentally friendly and provide the longest service life.

The granite and pre-cast concrete panels that make up the majority of the façade are fixed materials and need to be maintained to ensure proper performance. Currently there are two main materials that are required for the CCJC restoration project: sealants and water repellents.

- Sealants or caulk joints are found at all joints between granite panels and at the perimeters of all fenestrations. There are two main sealant types, silicone and urethane. Both types have products that meet or exceed the current Ohio VOC compliance regulation while still offering proper adhesion, movement and performance. Typically silicone based sealants are found to perform better for longer than urethanes.
- Water repellents are used on stone and precast to prevent water infiltration and resulting damage. Current low-VOC compliant materials provide between five and seven years of protection.

The windows, curtain walls, and doors are largely original to the building. Although they are still generally performing (leaks are largely attributed to the failed sealant joints) there have been marked improvements in energy efficiencies in these items since the CCJC was constructed. We recommend these items be replaced for a greater level of energy efficiency.

We recommend replacing various windows through the CCJS. The County and City should way the cost, performance, and energy efficiency when determining the type of windows required. For example, single-pane glass windows are less expensive to install, however, because of their inefficiencies in allowing high rates of heat transfer (U-Value) and low rates of heat resistance (R-Value) they are not ideal as a sustainable design choice.

Although windows always have the lowest R-Value of a façade assembly, there are improvements that can be made over the current window structures that will increase energy efficiency. Single-pane windows typically have an R-Value of almost 1, while the R-Value of double-pane windows can vary depending on low emissivity or Low-E glazing, the thickness of the glass, tightness of the installation, and the air space between the panes. These factors can increase the R-Value to as high as 3. Suspending insulating film between the panes can also add to the window's R-Value by as much as 1. Replacing air with argon gas can also increase the R-Value of a window.

**ROOFS:**

Current trends in sustainable roof design in the US have advanced significantly in the past 10 years to include garden roofs, cool roofs/reflective surfaces, daylighting, Photovoltaic (PV) Solar Panels, recycling and low VOC membranes and adhesives. However, to be truly sustainable, a roof system must be easily maintainable and ensure that the membranes don't fail.

The rubberized asphalt roofs in place at the CCJC are of an age, type, and condition that offer little sustainable renovation opportunities. Given the age and condition, we recommend that all roofs be scheduled for replacement. The EPDM and Modified Bitumen roofs are also at or near the end of their useful service lives. New roof systems should be selected based on longevity, maintainable service life, recycled material content, and impact on the environment. Increasing the "R-Value" of the insulation to at least the code required R-25 (as of January 2014) will help reduce the energy needed to heat and cool the structures. In addition to the system replacement, we recommend a regular roof maintenance program be developed to ensure the long-term function of the roof system and insulation. This program contributes to longer life spaces and reduced energy loss as the materials / buildings age.

**<u>COMMISSIONING:</u>**

Commissioning is a systematic process to ensure all building systems perform as designed and meet the owner's operational needs. Because all building systems are integrated, a deficiency in one component can result in sub-optimal operation and performance among other components. On average, the operating costs of a commissioned building range from eight to twenty percent below that of a non-commissioned building. The one-time investment in commissioning for a building, typically ranging from 0.5 to 1.5 percent of construction costs, can result in reduced operating costs over the life of the building far in excess of the cost of commissioning.

Retro-commissioning applies a systematic investigative process for improving and optimizing a building's operation and maintenance (O&M). Retro-commissioning occurs after construction, as an independent process and is typically applied to buildings that have not previously been commissioned. It may or may not emphasize bringing the building back to its original intended design. In fact, original design documentation may no longer exist or may be irrelevant based on current operating needs.

The goal of retro-commissioning is to maximize system functionality. It is a holistic and systematic process intended not only to optimize how equipment and systems operate, but also to optimize how the systems function together. Although retro-commissioning may result in recommendations to investigate further capital improvements, O&M tune-up activities and diagnostic testing are primarily used to optimize the building systems. The goals and objectives for applying the process, as well as the level of rigor, may vary depending on the current needs of the owner, the budget, and the condition of the equipment. Typically, the level of effort is consistent with an ASHRAE Level 2 energy audit and most often focuses on dynamic energy-consuming systems, with the goal of reducing energy waste, obtaining energy cost savings, and identifying and addressing existing problems.

After the initial retro-commissioning is performed, it is recommended that the building should be periodically re-commissioned. Typically recommissioning should occur on an annual or bi-annual basis.

<u>Pros:</u>

- Identification of system operating, control, and maintenance issues
- Reduction of maintenance cost and premature equipment failure
- Reduction of energy cost and waste
- Collection of data for long-term planning and maintenance budgeting
- Improved comfort

Cons:
Need to allocate and train maintenance staff and/or hire an outside commissioning firm

**PERFORMANCE MEASUREMENT**
We recommend that the County / City install real-time energy and water consumption metering and submetering that can be monitored and trended through the Building Automation System (BAS). In addition, a measurement and verification plan should be developed to track and trend actual performance of energy and water conservation measures (ECMs).

Pros:
- Environmentally friendly
- Good maintenance diagnostic tool
- Good tool for identifying potential opportunities for energy and water conservation

Cons:
- First cost of metering
- Meters need to be periodically calibrated
- Someone needs to periodically review metering data

**REFRIGERANT MANAGEMENT**
We recommend that the County / City use refrigerants to minimize or eliminate the emission of compounds that contribute to: ozone depletion and global warming in packaged unitary HVAC cooling equipment, fire-suppression systems, electric water coolers, and appliances such as refrigerators and freezers. Maintain equipment to prevent leakage of refrigerant in the atmosphere. District chilled water systems owned by a third party are exempt.

Pros:
- Environmentally friendly

Cons:
- First cost to replace existing equipment

**SOLID WASTE MANAGEMENT**
We recommend that the County / City maintain a waste reduction and recycling program for office equipment (computers, monitors, copiers, printers, scanners, fax machines), appliances (refrigerators, dishwashers, water coolers), paper, toner cartridges, batteries, glass, plastics, cardboard, food waste, and metals.

Pros:
- Environmentally friendly

Cons:
- Additional staff may be needed to implement program

**IMPROVE BUILDING AIR QUALITY**
We recommend that the County / City meet or exceed ASHRAE 62.1-2007 ventilation requirements. Measure carbon dioxide ($CO_2$) levels in outside air, air handler return, air mains, and at zone level to ensure adequate ventilation is being provided to building occupants. Provide filtration with a

minimum efficiency reporting value (MERV) of at least MERV 13. Install outdoor air flow monitoring stations to ensure that minimum ventilation is being provided to maintain air quality as well as proper building pressurization.

Pros:

- Environmentally friendly
- Improved occupant wellbeing and productivity
- Increased energy savings through demand control ventilation

Cons:

- First cost to install $CO_2$ sensors and air flow stations
- $CO_2$ sensors require periodic calibration
- Outside air flow stations require periodic maintenance and calibration
- Outside air likely may contain contaminants at levels that exceed ASHRAE 62.1-2007

**OCCUPANT COMFORT**

We recommend that the County / City provide a high level of lighting and temperature control by individual occupants or groups in multi-occupant spaces (e.g. classrooms or conference areas). Utilize a BAS to monitor and have the ability to trend log space temperature, relative humidity, and carbon dioxide levels to act as a diagnostic tool for comfort related issues.

Pros:

- Environmentally friendly
- Improved occupant well-being and productivity
- Can aid in troubleshooting maintenance issues some of which may reduce energy

Cons:

- In order to adequately address occupant comfort issues, extensive upgrades may be required
- Someone has to monitor BAS and set up and review trends
- First cost to provide for a high level of individual occupant control of lighting and temperature

**GREEN CLEANING**

We recommend that the County / City implement a high-performance cleaning program, supported by policy, staffing plans, standard operating procedures, and storage procedures that address sustainable and effective cleaning. Cleaning products should meet the appropriate Green Seal, Environmental Choice and/or EPA standards. Select cleaning equipment that reduces building contaminants with minimal environmental impact. Implement an indoor pest management program to reduce sources of food, water, and shelter for pests and minimize the use of pesticides.

Pros:

- Environmentally friendly

Cons:

- Potential higher cost
- Potential availability issues
- Most environmentally friendly alternative may not be the most effective

## 5.2. Life Cycle Cost Analysis

As part of the facility assessment, a separate lifecycle cost analysis was performed for the Courts Tower/Atrium complex, Jail I, Jail II, and the Cleveland Police Headquarters Building. Energy models of each building were created using construction drawings and information obtained during the assessment. The models were calibrated to match the buildings' actual energy consumption. Opportunities for energy reduction were identified and modeled to determine the energy cost savings. Detailed cost estimates were performed for each energy conservation measure (ECM) to determine the cost of implementation. The simple payback of each ECM was calculated to determine which ECMs should be recommended. Refer to the table below for a summary of the 29 ECMs identified.

| | | | Annual Savings | | | | | | Metrics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Building | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| Jail I | Occupancy Sensors | $60,779 | 591,016 | 60 | 82,450 | 3,078 | $72,409 | $0 | 20 | 0.8 | 0.8 |
| Police | Occupancy Sensors | $107,855 | 906,517 | -385 | 88,750 | 3,698 | $86,697 | $0 | 20 | 1.2 | 1.1 |
| Courts Tower | Occupancy Sensors | $145,311 | 358,149 | -4 | 44,967 | 1,757 | $41,164 | $0 | 20 | 3.5 | 1.6 |
| Courts Tower | Variable Primary Pumps | $733,616 | 1,599,073 | 0 | 0 | 5,456 | $111,935 | $50,000 | 30 | 4.5 | 2.9 |
| Police | LED Lighting Upgrade | $1,291,280 | 1,219,172 | -181 | 172,492 | 6,014 | $143,345 | $133,109 | 20 | 4.7 | 3.7 |
| Jail I | Garage Heat Recovery & CO2 | $475,952 | 121,649 | 3,814 | 0 | 4,969 | $94,759 | $0 | 30 | 5.0 | 3.8 |
| Jail I | Variable Primary Pumps | $490,991 | 765,268 | 0 | 0 | 2,611 | $53,569 | $30,000 | 30 | 5.9 | 4.0 |
| Jail II | Occupancy Sensors | $51,923 | 99,188 | -86 | 9,333 | 347 | $8,351 | $0 | 20 | 6.2 | 4.1 |
| Jail I | LED Lighting Upgrade | $1,760,589 | 1,195,120 | -99 | 189,492 | 6,233 | $149,635 | $120,200 | 20 | 6.5 | 4.7 |
| Courts Tower | Garage LED Lighting | $188,541 | 168,057 | 0 | 0 | 573 | $11,764 | $13,840 | 20 | 7.4 | 4.7 |
| Jail I | Garage LED Lighting | $75,083 | 66,926 | 0 | 0 | 228 | $4,685 | $5,512 | 20 | 7.4 | 4.8 |
| Police | Façade Maintenance | $352,648 | 6,020 | 1,951 | 8,242 | 2,449 | $47,497 | $0 | 40 | 7.4 | 4.9 |
| Courts Tower | LED Lighting Upgrade | $2,019,997 | 595,427 | 537 | 143,808 | 4,398 | $105,593 | $139,881 | 20 | 8.2 | 5.4 |
| Police | Variable Speed Pumps | $365,462 | 446,325 | 0 | 0 | 1,523 | $31,243 | $10,000 | 30 | 8.9 | 5.5 |
| Jail II | LED Lighting Upgrade | $547,170 | 367,266 | -476 | 38,767 | 1,150 | $28,897 | $23,460 | 20 | 10.5 | 5.7 |
| Jail I | Façade Maintenance | $636,435 | 69,080 | 2,197 | -3,250 | 2,820 | $53,332 | $0 | 40 | 11.9 | 5.9 |
| Police | VAV with Advanced Controls | $3,565,081 | 807,637 | 2,317 | 387,292 | 10,170 | $248,345 | $30,000 | 30 | 12.8 | 7.0 |
| Police | Garage LED Lighting | $126,104 | 84,201 | -94 | 0 | 175 | $3,768 | $4,547 | 20 | 15.2 | 7.0 |
| Courts Tower | VAV with Advanced Controls | $13,812,502 | 2,739,128 | 6,802 | 882,908 | 28,063 | $663,389 | $220,000 | 30 | 15.6 | 9.8 |
| Jail II | VAV with Advanced Controls | $3,790,099 | 986,794 | 4,710 | -75,617 | 8,083 | $148,336 | $80,000 | 30 | 16.6 | 10.3 |
| Jail II | Variable Speed Pumps | $280,293 | 237,335 | 0 | 0 | 810 | $16,613 | $0 | 30 | 16.9 | 10.3 |
| Courts Tower | Daylight Harvesting | $761,211 | 270,509 | 162 | 61,458 | 1,854 | $44,730 | $0 | 20 | 17.0 | 10.4 |
| Jail I | VAV with Advanced Controls | $7,040,204 | 1,385,672 | 4,787 | 257,383 | 13,532 | $297,891 | $50,000 | 30 | 20.2 | 11.4 |
| Courts Tower | Façade Maintenance | $685,462 | -15,192 | 1,108 | -15,283 | 1,088 | $18,487 | $0 | 40 | 37.1 | 11.6 |
| Courts Tower | Window Upgrade | $12,684,627 | 553,384 | 6,953 | 261,675 | 13,330 | $290,151 | $0 | 30 | 43.7 | 14.1 |
| Jail II | Roof Replacement | $398,199 | 2,706 | 52 | 1,417 | 88 | $1,872 | $0 | 40 | 212.8 | 14.2 |
| Jail I | Roof Replacement | $799,465 | -13,152 | 105 | 942 | 91 | $1,782 | $0 | 40 | 448.7 | 14.4 |
| Police | Roof Replacement | $591,627 | -1,096 | 44 | 900 | 59 | $1,232 | $0 | 40 | 480.2 | 14.6 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Courts Tower | Roof Replacement | $2,081,972 | 1,700 | 74 | 575 | 101 | $1,992 | $0 | 40 | 1045.0 | 15.1 |
| **Total** | | **$55,920,476** | **15,613,879** | **34,346** | **2,538,700** | **124,748** | **$2,783,464** | **$910,550** | **29.7** | **15.1** | |

(1) Does not include cost of replacing existing HVAC system with the same equipment in five years.

The roof replacements for all four buildings have a long payback, greater than 200 years. Replacing the roofs is not recommended solely for energy saving because the payback is so long, but the roofs should be replaced when necessary due to their condition. With the exception of expensive upgrades to the Courts Tower windows and facade, the rest of the Energy Conservation Measures (EMS) can be implemented within a 20 year simple payback period. The envelope and lighting ECMs should be implemented before or concurrently with the HVAC ECMs in order to reduce the size and installation costs of a new HVAC system.

Upgrading the water closets, urinals, and lavatories to low flow was assessed for the Courts Tower, Atrium, and Cleveland Police Headquarters Building. These water conservation measures resulted in an annual utility and maintenance cost savings of $459,428 with a simple payback of 19.2 years.

| Building | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | Metrics | |
|---|---|---|---|---|---|---|
| | | Water / Sewer (mcf) | Water / Sewer Cost Savings | Maintenance Cost Savings | Expected Useful Life | Simple Payback Period (SPP) |
| Courts Tower | $841,956 | 238 | $21,275 | $10,741 | 30 | 26.3 |
| Atrium | $33,618 | 28 | $2,515 | $406 | 30 | 11.5 |
| Police | $265,550 | 238 | $21,208 | $3,283 | 30 | 10.8 |
| **Total** | **$1,141,124** | **504** | **$44,998** | **$14,430** | **30** | **19.2** |

After the simple payback of each energy and water conservation measure was evaluated, the lifecycle cost of each existing building was compared to the lifecycle cost of each building with all ECMs implemented over a 20 year time period. The lifecycle cost analysis includes inflation of equipment, maintenance, and utility costs to provide a more realistic picture of the costs associated with operating the buildings and implementing the ECMs over the course of 20 years.

If all 29 ECMs and 9 water conservation measures are implemented, the buildings can save **$36,824,616 in lifecycle cost** over a 20 year period. Refer to the table below for a summary of the lifecycle cost analysis.

| Building | Existing Building Lifecycle Cost | Lifecycle Cost with all ECMs | Lifecycle Cost Difference | Percent Savings |
|---|---|---|---|---|
| Courts Tower/Atrium | $45,712,476 | $37,573,791 | $8,138,685 | 17.8% |
| Jail I | $33,578,682 | $20,692,120 | $12,886,563 | 38.4% |
| Jail II | $18,189,946 | $13,552,869 | $4,637,077 | 25.5% |
| Police Building | $24,679,297 | $13,517,005 | $11,162,292 | 45.2% |
| **Total** | **$122,160,401** | **$85,335,785** | **$36,824,616** | **30.1%** |

The life cycle cost savings of implementing all 29 ECMs would be even greater if the building envelope upgrades were made in advance of the HVAC upgrades, and if the lighting upgrades were performed concurrently with the HVAC upgrades. This is possible since the building envelope and lighting upgrades reduce the peak sensible cooling demand, which in turn reduces the first cost of the HVAC system. Replacement of ceiling, lights, HVAC air distribution, and the addition of sprinklers should be performed concurrently in order to minimize disruption and initial cost. This is particularly true since a one for one replacement of the lights, diffusers and VAV boxes does not adequately address comfort and energy efficiency.

The Courts Tower / Atrium existing air handling capacity of 427,000 cfm is insufficient to meet the current building cooling needs. In order to meet the existing building cooling demands, the total system airflow needs to increase to 555,000 cfm, or 30% greater than the existing system size of 427,000 cfm. This is due to the increased occupancy and internal loads over the original design intent. If the system is converted to a complete VAV system, the total system airflow will only need to be 470,000 cfm since the airflow can be reduced due to diversity in thermal loads at the perimeter spaces facing different directions. If all of the energy conservation measures recommended in this Report are implemented, the total system size can be decreased even further to approximately 365,000 cfm, which is 17% less than the current system. A smaller system size, reduced number of air handling units, and less complicated system, decreases the initial cost of equipment and ductwork substantially.

**METHODOLOGY**

Our team used the Trane Trace 700 v6.4 energy simulation software based analysis to evaluate the energy savings potential of Building HVAC, lighting, and envelope upgrades. In an effort to estimate energy savings, we initial determined the facility's baseline energy consumption. The detailed utility analysis presented earlier in this Chapter established historical energy consumption and trends.

The baseline energy model was developed based using data collected during our site visits, interviews with maintenance staff, and a review of existing drawings and specifications. The baseline energy model was compared to the utility analysis. Any discrepancies were identified, further investigations were conducted, and the baseline model was calibrated to reflect actual usage and operational characteristics. The baseline energy model serves as a reference point to compare the effect of proposed Energy Conservation Measures (ECMs), testing individual and combined effects on utility consumption and cost. ECMs are modifications made to the building envelope, lighting, and HVAC systems that improve the building's operation and reduce its energy consumption.

Potential energy savings opportunities were evaluated globally, without "double counting" savings. The data generated by the simulation was used to evaluate the first cost, energy reduction, and payback of the recommended enhancements for the Justice Center Complex.

The Courts Tower, Atrium, and Jail I were first modeled together since they share the same utility meters. Once the model was calibrated to match the actual utility data, the model was split up between Courts Towers/Atrium and Jail I. Jail I was separated from the Courts Tower model since it has a significantly different operation. The Atrium was kept on the Courts Tower model because the two buildings share many of the same HVAC systems making it difficult to model the HVAC energy conservation measures separately. Jail II and the Cleveland Police Headquarters Building were each modeled separately, resulting in a total of four buildings.

Water savings was calculated using the same methodology as LEED prerequisite WEp1: Water Use Reduction. Typical daily utilization rates were assumed for each type of occupant to determine the savings for upgrading to more efficient fixtures.

Detailed cost estimates were performed for each energy and water conservation measure to determine the cost of implementation. Refer to Appendices D thru G for detailed cost estimates by building. The following parameters were used to determine ECM project costs:

- Labor Rate: $65 per hour, no overtime
- General Conditions: 10% markup
- Architectural Fees: 8% for A/E
- Contingency: 10% for construction

The cost to replace the existing equipment one-for-one in the existing building was estimated at $30 per sf, which was incorporated into the lifecycle cost analysis at Year 5. Ceiling replacement cost was not included in the cost estimates.

## SUMMARY RESULTS

### Courts Tower/Atrium Summary Results

After the Courts Tower and Atrium building conditions were assessed, nine opportunities for energy improvement were identified and evaluated. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume. Lighting upgrades evaluated include replacing the lighting fixtures with LEDs, adding occupancy sensors, and implementing daylight harvesting. Potential envelope upgrades include installing a new roof, repairing the facade, and replacing the windows. Refer to Section 4 for detailed descriptions of the ECMs and Section 8.1 for the lifecycle cost analysis.

The nine energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all nine energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by over $1,500,000 with a simple **payback of 19.3 years.** The **lifecycle cost difference is $8,138,685** over a period of 20 years.

| ECM # | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings: Electricity | Annual Savings: District Steam | Annual Savings: District Chilled Water | Annual Savings: Total Energy | Annual Savings: Energy Cost Savings | Annual Savings: Maintenance Cost Savings (1) | Metrics: Expected Useful life | Metrics: Simple Payback Period (SPP) | Metrics: Cumulative SPP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| 1 | Occupancy Sensors | $145,311 | 358,149 | -4 | 44,967 | 1,757 | $41,164 | $0 | 20 | 3.5 | 3.5 |
| 2 | Variable Primary Pumps | $733,616 | 1,599,073 | 0 | 0 | 5,456 | $111,935 | $50,000 | 30 | 4.5 | 4.3 |
| 3 | Garage LED Lighting | $188,541 | 168,057 | 0 | 0 | 573 | $11,764 | $13,840 | 20 | 7.4 | 4.7 |
| 4 | LED Lighting Upgrade | $2,019,997 | 595,427 | 537 | 143,808 | 4,398 | $105,593 | $139,881 | 20 | 8.2 | 6.5 |
| 5 | VAV with Advanced Controls | $13,812,502 | 2,739,128 | 6,802 | 882,908 | 28,063 | $663,389 | $220,000 | 30 | 15.6 | 12.4 |
| 6 | Daylight Harvesting | $761,211 | 270,509 | 162 | 61,458 | 1,854 | $44,730 | $0 | 20 | 17.0 | 12.6 |
| 7 | Façade Maintenance | $685,462 | -15,192 | 1,108 | -15,283 | 1,088 | $18,487 | $0 | 40 | 37.1 | 12.9 |
| 8 | Window Upgrade | $12,684,627 | 553,384 | 6,953 | 261,675 | 13,330 | $290,151 | $0 | 30 | 43.7 | 18.1 |
| 9 | Roof Replacement | $2,081,972 | 1,700 | 74 | 575 | 101 | $1,992 | $0 | 40 | 1045.0 | 19.3 |
| **Total** | | **$33,113,238** | **6,270,235** | **15,632** | **1,380,108** | **56,621** | **$1,289,206** | **$423,721** | **29.9** | **19.3** | |

(1) Does not include cost of replacing existing HVAC system with the same equipment.

ECMs 1-4 (shown in green) are low cost energy conservation measures that should be considered in the near future. ECMs 5-6 (shown in yellow) are capital-investment projects with a simple payback period (SPP) between 10 and 25 years. ECMs 7-8 (shown in orange) are capital-intensive projects that have SPPs of greater than 25 years and should be considered where synergies exist with other capital projects. ECM-9 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-6 in the near future since the SPP is reasonable and the improvements will have a significant effect on the buildings' operation and maintenance costs. If ECMs 7-8 are selected, they should be implemented before or together with ECM-2 and ECM-5 to decrease the size of the new HVAC systems, resulting in a lower installation cost. ECM-9 is not recommended as an energy conservation project since the SPP is so long.

Upgrading the water closets, urinals, and lavatories to low flow was also assessed. These water conservation measures resulted in an annual utility and maintenance cost savings of $32,016 for the Courts Tower and $2,921 for the Atrium, with a combined simple payback of 25.1 years.

**JAIL I Summary Results**

Eight opportunities for energy improvement were identified and evaluated for Jail I. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume and replacing the garage ventilation system. Lighting upgrades evaluated include replacing the lighting fixtures with LEDs and adding occupancy sensors. Potential envelope upgrades include installing a new roof and repairing the facade.

The eight energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all eight energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by nearly $1,000,000 with a simple **payback of 12.1 years.** The **lifecycle cost difference is $12,886,563** over a period of 20 years.

| ECM # | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | | | | Metrics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| 1 | Occupancy Sensors | $60,779 | 591,016 | 60 | 82,450 | 3,078 | $72,409 | $0 | 20 | 0.8 | 0.8 |
| 2 | Garage Heat Recovery & CO2 | $475,952 | 121,649 | 3,814 | 0 | 4,969 | $94,759 | $0 | 30 | 5.0 | 3.2 |
| 3 | Variable Primary Pumps | $490,991 | 765,268 | 0 | 0 | 2,611 | $53,569 | $30,000 | 30 | 5.9 | 4.1 |
| 4 | LED Lighting Upgrade | $1,760,589 | 1,195,120 | -99 | 189,492 | 6,233 | $149,635 | $120,200 | 20 | 6.5 | 5.4 |
| 5 | Garage LED Lighting | $75,083 | 66,926 | 0 | 0 | 228 | $4,685 | $5,512 | 20 | 7.4 | 5.4 |
| 6 | Façade Maintenance | $636,435 | 69,080 | 2,197 | -3,250 | 2,820 | $53,332 | $0 | 40 | 11.9 | 6.0 |
| 7 | VAV with Advanced Controls | $7,040,204 | 1,385,672 | 4,787 | 257,383 | 13,532 | $297,891 | $50,000 | 30 | 20.2 | 11.3 |
| 8 | Roof Replacement | $799,465 | -13,152 | 105 | 942 | 91 | $1,782 | $0 | 40 | 448.7 | 12.1 |
| **Total** | | **$11,339,498** | **4,181,579** | **10,864** | **527,017** | **33,563** | **$728,062** | **$205,712** | **29.6** | **12.1** | |

ECMs 1-5 (shown in green) are low cost energy conservation measures that should be considered in the near future. ECMs 6-7 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 10 and 25 years. ECM-8 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-7 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. ECM-8 is not recommended as an energy conservation project since the SPP is so long.

**JAIL II Summary Results**

Five opportunities for energy improvement were identified and evaluated for Jail II. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume. Lighting upgrades evaluated include replacing the lighting fixtures with LEDs and adding occupancy sensors. Potential envelope upgrades include installing a new roof. Refer to Section 6 for detailed descriptions of the recommended ECMs and Section 8.3 for the lifecycle cost analysis.

The five energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all five energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by over $300,000 with a simple **payback of 16.5 years.** The **lifecycle cost difference is $4,637,077** over a period of 20 years.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | | | 347 | $8,351 | $0 | 20 | | 6.2 |
| 2 | | | 1,150 | $28,897 | $23,460 | 20 | | 9.9 |
| 3 | | | 8,083 | $148,336 | $80,000 | 30 | | 15.2 |
| 4 | | | 810 | $16,613 | $0 | 30 | | 15.3 |
| 5 | | | 88 | $1,872 | $0 | 40 | | 16.5 |

ECM 1 (shown in green) is a low cost energy conservation measure that should be considered in the near future. ECMs 2-4 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 10 and 25 years. ECM-5 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-4 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. ECM-5 is not recommended as an energy conservation project since the SPP is so long.

**Cleveland Police Headquarters Building Results**

Seven opportunities for energy improvement were identified and evaluated for the Cleveland Police Headquarters Building. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume. Lighting upgrades evaluated include replacing the interior lighting fixtures with LEDs, adding occupancy sensors, and upgrading the garage lights to LED. Potential envelope upgrades include installing a new roof and repairing the facade.

The seven energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all seven energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by over $500,000 with a simple **payback of 8.7 years.** The **lifecycle cost difference is $11,162,292** over a period of 20 years.

| | | | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| 1 | Occupancy Sensors | $107,855 | 906,517 | -385 | 88,750 | 3,698 | $86,697 | $0 | 20 | 1.2 | 1.2 |
| 2 | LED Lighting Upgrade | $1,291,280 | 1,219,172 | -181 | 172,492 | 6,014 | $143,345 | $133,109 | 20 | 4.7 | 3.9 |
| 3 | Façade Maintenance | $352,648 | 6,020 | 1,951 | 8,242 | 2,449 | $47,497 | $0 | 40 | 7.4 | 4.3 |
| 4 | Variable Speed Pumps | $365,462 | 446,325 | 0 | 0 | 1,523 | $31,243 | $10,000 | 30 | 8.9 | 4.7 |
| 5 | VAV with Advanced Controls | $3,565,081 | 807,637 | 2,317 | 387,292 | 10,170 | $248,345 | $30,000 | 30 | 12.8 | 7.8 |
| 6 | Garage LED Lighting | $126,104 | 84,201 | -94 | 0 | 175 | $3,768 | $4,547 | 20 | 15.2 | 7.9 |
| 7 | Roof Replacement | $591,627 | -1,096 | 44 | 900 | 59 | $1,232 | $0 | 40 | 480.2 | 8.7 |
| **Total** | | **$6,400,057** | **3,468,776** | **3,651** | **657,675** | **24,087** | **$562,127** | **$177,657** | **29.1** | **8.7** | |

ECMs 1-4 (shown in green) are low cost energy conservation measures that should be considered in the near future. ECMs 5-6 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 5 and 25 years. ECM-7 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-6 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. ECM-7 is not recommended as an energy conservation project since the SPP is so long.

Upgrading the water closets, urinals, and lavatories to low flow was also assessed. These water conservation measures resulted in an annual utility and maintenance cost savings of $59,428, with a simple payback of 10.8 years.

Refer to Appendix L for the full Life Cycle Cost Analysis Report.

## 5.3. Capital Improvement Cost Summary[4]

Cost estimates (2013 dollars) have been prepared for deferred maintenance, remodel, renovation, and component replacement requirements. For average construction/direct costs, information sources included RSMeans™ and local experience. Cost estimates and Values are considered Rough Order of Magnitude (ROM) and intended for high level evaluation. Project cost accounts for average construction including contractor markups, overhead, profit, and owner soft costs (architectural/engineering fees, project management fees, and contingencies). Capital improvement cost estimates and asset value estimates do not account for land acquisition, site development, escalation, furniture/fixture/equipment fees, or financing cost.

### 5.3.1. Year 1 Estimated Capital Expenditure

The projects recommended with this capital expenditure include the following:

- Atrium smoke control
- HVAC improvements in the parking garages
- Increased or modified exit signage
- Created a key management system
- Testing primary fire dampers
- Building envelope improvements
- Security improvements at the parking garages and site
- Elevator modernization at Jail II

[4] The ROM estimates for cost of work and value of assets/components prepared by the assessment team represent judgments as building specialists and cost estimators familiar with the construction industry. It is recognized, however, that neither the Assessment Team nor the County-City has control over the cost of labor, materials, equipment, the Contractor's methods of determining bid prices, competitive bidding processes, and/or market and negotiating conditions. Accordingly, the Assessment Team cannot and does not warrant or represent that contractor bids or negotiated prices will not vary from the figures in this Report.

*Table 18: Year 1 Capital Expenditures by Building*

| | | Atrium YR 1 | CT YR 1 | Jail I YR 1 | Jail II YR 1 | CMPH YR 1 | Total YR 1 |
|---|---|---|---|---|---|---|---|
| A10- Foundations | | $0 | $0 | $0 | $0 | $0 | $0 |
| B10- Superstructure | | $0 | $0 | $0 | $0 | $0 | $0 |
| B20- Exterior Enclosure | | $263,294 | $5,005,626 | $2,745,875 | $0 | $461,391 | $8,476,185 |
| B30- Roofing | | $0 | $0 | $0 | $0 | $0 | $0 |
| C10- Interior Construction | | $0 | $0 | $0 | $0 | $0 | $0 |
| C20- Stairs | | $0 | $0 | $0 | $0 | $0 | $0 |
| C30- Interior Finishes | | $28,803 | $0 | $0 | $0 | $0 | $28,803 |
| D10- Conveying | | $3,445 | $0 | $0 | $1,584,844 | $0 | $1,588,289 |
| D20- Plumbing | | $0 | $0 | $0 | $0 | $0 | $0 |
| D30- HVAC | | $551,250 | $0 | $137,813 | $34,453 | $0 | $723,516 |
| D40- Fire Protection | | $0 | $0 | $8,269 | $0 | $0 | $8,269 |
| D50- Electrical | | $34,453 | $0 | $0 | $0 | $0 | $34,453 |
| E- Equipment/Jail | | $0 | $0 | $0 | $155,864 | $0 | $155,864 |
| E- Garage | | $0 | $0 | $0 | $0 | $0 | $0 |
| **Total** | | **$881,245** | **$5,005,626** | **$2,891,957** | **$1,775,161** | **$461,391** | **$11,015,379** |

### 5.3.2. Year 2-4 Estimated Capital Expenditures

The projects contemplated for this capital expenditure include the following:

- Complete renovation of the Police Building
- Maintenance to the interiors of the Atrium
- Infrastructure improvements at the Courts Tower including main electrical system
- Upgrades and mechanical system replacement
- Parking garage repairs to concrete and coatings
- Roof replacement at the Courts Tower and Corrections Center (Jail I)
- Deferred maintenance modifications in Jail I and II

*Table 19: Years 2-4 Capital Expenditures by Building*

| | | Atrium YR 2-4 | CT YR 2-4 | Jail I YR 2-4 | Jail II YR 2-4 | CMPH YR 2-4 | Total YR 2-4 |
|---|---|---|---|---|---|---|---|
| A10- Foundations | | $0 | $0 | $0 | $0 | $0 | $0 |
| B10- Superstructure | | $0 | $1,674,422 | $1,639,969 | $0 | $3,501,430 | $6,815,820 |
| B20- Exterior Enclosure | | $49,702 | $255,584 | $381,812 | $0 | $4,172,814 | $4,859,912 |
| B30- Roofing | | $0 | $2,255,095 | $5,912,508 | $612,838 | $1,456,292 | $10,236,733 |
| C10- Interior Construction | | $20,948 | $1,320,657 | $97,433 | $70,284 | $4,434,506 | $5,943,828 |
| C20- Stairs | | $0 | $0 | $0 | $0 | $0 | $0 |
| C30- Interior Finishes | | $663,835 | $750,087 | $796,420 | $361,818 | $2,660,739 | $5,232,899 |
| D10- Conveying | | $248,063 | $1,240,313 | $744,188 | $0 | $1,901,813 | $4,134,375 |
| D20- Plumbing | | $0 | $0 | $140,628 | $241,172 | $2,057,678 | $2,439,479 |
| D30- HVAC | | $0 | $13,880,854 | $1,574,196 | $819,984 | $11,162,813 | $27,437,847 |
| D40- Fire Protection | | $0 | $42,722 | $10,336 | $27,563 | $2,344,191 | $2,424,811 |
| D50- Electrical | | $471,237 | $4,266,974 | $3,197,477 | $654,609 | $10,712,579 | $19,302,876 |
| E- Equipment/Jail | | $0 | $0 | $0 | $311,728 | $206,719 | $518,446 |
| E- Garage | | $0 | $2,401,383 | $2,076,490 | $0 | $5,329,781 | $9,807,654 |
| **Total** | | **$1,453,784** | **$28,088,090** | **$16,571,457** | **$3,099,997** | **$49,941,354** | **$99,154,682** |

### 5.3.3. Year 5-8 Estimated Capital Expenditures

The projects contemplated for this capital expenditure include the following:

- Deferred maintenance to the Atrium skylight
- Completely renovate Floors 23-11 in the Courts Tower
- Infrastructure improvements at the Jail I including main electrical system upgrades and mechanical system replacement
- Security upgrades at Jail I equipment
- Structural improvements at the parking garage including concrete and coatings
- Deferred maintenance modifications in Jail I and II

*Table 20: Years 5-8 Capital Expenditures by Building*

| | | Atrium YR 5-8 | CT YR 5-8 | Jail I YR 5-8 | Jail II YR 5-8 | CMPH YR 5-8 | Total YR 5-8 |
|---|---|---|---|---|---|---|---|
| A10- Foundations | | $0 | $0 | $0 | $10,336 | $0 | $10,336 |
| B10- Superstructure | | $0 | $1,674,422 | $819,984 | $10,680 | $0 | $2,505,087 |
| B20- Exterior Enclosure | | $0 | $0 | $0 | $798,152 | $0 | $798,152 |
| B30- Roofing | | $370,991 | $0 | $0 | $0 | $0 | $370,991 |
| C10- Interior Construction | | $0 | $4,726,290 | $1,204,887 | $168,131 | $0 | $6,099,309 |
| C20- Stairs | | $0 | $0 | $0 | $0 | $0 | $0 |
| C30- Interior Finishes | | $0 | $3,725,740 | $971,697 | $305,186 | $0 | $5,002,622 |
| D10- Conveying | | $0 | $0 | $0 | $0 | $0 | $0 |
| D20- Plumbing | | $0 | $2,348,499 | $863,325 | $0 | $0 | $3,211,824 |
| D30- HVAC | | $0 | $6,940,427 | $13,030,172 | $0 | $0 | $19,970,599 |
| D40- Fire Protection | | $0 | $0 | $0 | $0 | $0 | $0 |
| D50- Electrical | | $0 | $8,143,897 | $3,612,781 | $751,078 | $0 | $12,507,756 |
| E- Equipment/Jail | | $0 | $0 | $3,445,313 | $779,319 | $0 | $4,224,632 |
| E- Garage | | $0 | $2,401,383 | $2,076,490 | $0 | $210,853 | $4,688,726 |
| **Total** | | **$370,991** | **$29,960,658** | **$26,024,648** | **$2,822,883** | **$210,853** | **$59,390,033** |

### 5.3.4. Year 9-12 Estimated Capital Expenditures

The projects contemplated for this capital expenditure include the following:

- Renovation of the Atrium
- Completely renovate Floors 10-1 in the Courts Tower
- Roof replacement at Jail I
- Security upgrades at Jail I and II equipment
- Major window replacement project throughout the original 1976 construction (Courts Tower, Jail I, Atrium and Police Building)
- Deferred maintenance modifications in Jail I and II

*Table 21: Years 9-12 Capital Expenditures by Building*

| | | Atrium YR 9-12 | CT YR 9-12 | Jail I YR 9-12 | Jail II YR 9-12 | CMPH YR 9-12 | Total YR 9-12 |
|---|---|---|---|---|---|---|---|
| A10- Foundations | | $0 | $0 | $0 | $0 | $0 | $0 |
| B10- Superstructure | | $0 | $0 | $0 | $0 | $0 | $0 |
| B20- Exterior Enclosure | | $1,093,329 | $6,399,143 | $4,658,250 | $93,386 | $2,431,309 | $14,675,416 |
| B30- Roofing | | $0 | $0 | $0 | $0 | $0 | $0 |
| C10- Interior Construction | | $1,456,612 | $4,926,263 | $2,586,249 | $71,767 | $0 | $9,040,892 |
| C20- Stairs | | $20,672 | $68,906 | $34,453 | $41,344 | $44,100 | $209,475 |
| C30- Interior Finishes | | $1,573,229 | $3,745,274 | $314,624 | $85,905 | $0 | $5,719,033 |
| D10- Conveying | | $0 | $0 | $0 | $0 | $0 | $0 |
| D20- Plumbing | | $413,438 | $2,210,687 | $351,571 | $0 | $0 | $2,975,695 |
| D30- HVAC | | $2,067,188 | $6,940,427 | $0 | $5,030,156 | $0 | $14,037,771 |
| D40- Fire Protection | | $1,183,877 | $0 | $0 | $0 | $0 | $1,183,877 |
| D50- Electrical | | $2,826,602 | $8,316,163 | $2,161,895 | $1,326,780 | $0 | $14,631,440 |
| E- Equipment/Jail | | $0 | $0 | $3,445,313 | $779,319 | $0 | $4,224,632 |
| E- Garage | | $0 | $0 | $0 | $0 | $144,703 | $144,703 |
| **Total** | | **$10,634,945** | **$32,606,863** | **$13,552,355** | **$7,428,658** | **$2,620,112** | **$66,842,933** |

### 5.3.5. Accessibility Modifications to the Site

There are three additional main renovation requirements that need to be implemented to bring the facility into compliance with current accessibility standards. They include:

- Accessible Path Wayfinding: Currently there is minimal signage directing users or visitors of the building to accessible entries via an accessible path. New signage would be required on the exterior of the building and on the grounds that accomplish this requirement.
- ADA Parking: New accommodations for public parking should be implemented at the plaza level on Ontario given its proximity to the "most accessible" building entrance point. Twelve (12) additional parking spaces should be added. Modification to the sidewalk (curbing and pavement) and structure over the underground parking area (waterproofing, landscape, and structure) will be required.

  Improvements to Curbs, Sidewalk, and Granite Panels: This is maintenance work to repair or replace damaged components on the site in several locations defined in Appendix J/Section 1 of this Report.

| ADA/ SITE IMPROVEMENTS | ROM EST |
|---|---|
| New Site Wayfinding Signage for Building Users and Visitors | $25,000 |
| New ADA Parking Spaces Near Building at Plaza | $216,000 |
| Repair/Replace Damaged Pedestrian Walkway Surfaces | $175,000 |
| **Total** | **$416,000** |

### 5.3.6. New Construction

The goal of this exercise was to determine the investment required to construct a new Cuyahoga County Justice Center Complex of similar size and nature either in this urban location or on another undetermined site. This exercise shows a very Rough Order of Magnitude estimate that could be expected if the County and City were to undertake this endeavor. Site evaluations were not conducted and we provided for average conditions (neither extreme nor favorable) relative to site conditions which may or may not include site infrastructure, site development, and demolition.

*Table 22: New Construction ROM Cost Estimate*

| COMPONENT | | ROM ESTIMATE |
|---|---|---:|
| Site Work/ Demolition | | $15,000,000 |
| A- Substructure | | $4,000,000 |
| B- Shell | | $108,000,000 |
| C- Interiors | | $44,000,000 |
| D- Services | | $134,000,000 |
| E- Equipment | | $34,000,000 |
| Parking Garage 850 Spaces | | $21,000,000 |
| **Sub-Total** | | **$360,000,000** |
| Contractor GC/OP | | $53,000,000 |
| Arch Design | | $32,000,000 |
| Owner Costs (Exp, FFE) | | $65,000,000 |
| Contingencies | | $65,000,000 |
| **Total** | | **$575,000,000** |

### 5.3.7. Recommended Next Steps

This project required the Assessment Team, in coordination with the County and City, to benchmark the current conditions of the Justice Center Complex. The Assessment Team was required to provide an analysis costs associate with extending the useful life of the Justice Center Complex, ultimately developing a framework for the County and City to follow for the upgrading and maintenance of the Justice Center Complex. As a result, below are recommended next steps. Overall, the County and City will need to determine if long term renovation of the current Justice Center Complex structure or if the construction of a new facility is preferred. Elements related to continued use of the existing facility include:

1. Confirmation of a 12 year financial commitment by the County and City addressing items in the existing Justice Center Complex to enable it to last an additional 25 years.
2. Determine whether a new purpose-built, multi-use facility constructed to current standards will be a better use of County and City funds over the long term to house Courts, Police, and parking operations. Refer to the Planning Report for multiple options.

3. Budget preparation, design, and plan to mitigate all water infiltration within the existing complex to protect the current structure until execution of major improvements.
4. Construction of street level accessible parking spaces
5. Installation of enhanced security measures at entrance and exit points of the Justice Center.
6. Execute corrective and component replacement work as recommended in this report.
7. Selection and implementation of a CMMS system that can be used upon completion of each year's renovation.
8. Implement the FY2014 recommendations.
9. Create a preventative / predictive maintenance plan and implement it.
10. Re-establish the complex baseline upon completion of each building renovation. Stay vigilant to update this on a yearly basis. Re-baseline every 3-5 years.

There are recommendations provided for each particular facility and component assessed. The underlying recommendations to be considered by the County and City are to modernize the Justice Center Complex in order to serve its needs for the next 25+ years or construct a new facility. No matter which direction is taken, upon implementation, we recommend a preventative maintenance program is established to maximize the future life cycle of building components.

### 5.3.7.1. Preventative / Predictive Maintenance Program

Preventive / predictive maintenance means refers to regularly scheduled repair and maintenance needed to keep a building component operating at peak efficiency and extend its useful life. Well-planned preventive / predictive maintenance extends the useful life of building components such as roofs or heating and ventilation systems, thereby preserving taxpayer investments. Below are five strategic practices identified to effectively manage preventive / predictive maintenance of the existing Justice Center Complex.

1. Building managers should inventory building components and inspect their condition upon completion of the 10-year renovation program described above. Before beginning preventive / predictive maintenance, building managers should inventory building components and their condition. Information on conditions helps identify needed maintenance. An outside Facility Condition Assessment firm or internal staff can perform this work and establish the baseline for the Justice Center Complex. Once a baseline is established a third party or internal staff should evaluate the building on a yearly basis. Every 3-4 years the building should be re-assessed. The yearly evaluations create valuable documentation for capital planning and measures the value of investments made in the facility for the previous year.
2. Building managers should set priorities for maintenance projects and evaluate projects' lifetime costs. Because the need for maintenance can outpace available resources, building managers should use an objective process to set priorities among projects. To make cost-effective decisions between renewal and maintaining existing building components, building managers should use an evaluation tool, such as life-cycle expectations and costing. For reliable costing we recommend using a Cost Consultant, Cost Engineer, LCCA Specialist or a nationally accepted estimating software such as RS Means.

3. The County and City should plan and budget strategically for preventive / predictive maintenance in the long and short-term. Unless planned, maintenance tends to occur when equipment breaks— typically a more costly arrangement that interrupts use of the building. Local jurisdictions should look out a minimum of three years and develop facility plans to guide maintenance that meets their overall needs. Preventive maintenance extends the useful life of building components.

   The County and City need a capital improvement program with specific proposals to meet their buildings' capital needs. Based on the long-term plans, building managers should develop an annual maintenance work plan that lists expected projects and analyzes personnel needs. The work plan should be linked to yearly operating and capital budgets. Local jurisdictions should establish reserved accounts to fund major maintenance and renewal of buildings, such as replacing building sealants.
4. Building managers are encouraged to structure a framework for operating a preventive / predictive maintenance program, including checklists and methods for preventive / predictive maintenance tasks. Building managers should coordinate preventive / predictive maintenance with other maintenance projects. Lodging responsibility for coordination with specific individuals enhances accountability. Including every piece of every building system in a preventive / predictive maintenance program is prohibitively expensive. Building managers must decide which equipment to exclude, such as equipment that can be replaced inexpensively. Another step is developing checklists of preventive / predictive maintenance tasks and their frequency. Building managers should also regularly schedule maintenance tasks as per recommendations of the manufacturer for a particular element.
5. Building managers should use tools, such as work-order systems, to optimize their preventive / predictive maintenance program. Doing so controls maintenance jobs and provides a written work record. Building managers also need a systematic way to keep maintenance records. This ranges from computerized maintenance management systems to simple spreadsheets to manual records.

To gauge how well a program is working, building managers should periodically evaluate their preventive/predictive maintenance program. We recommend this evaluation performed every 2 years. Given the size and complexity of the Justice Center Complex we recommend having dedicated maintenance staff assigned to the core components of the buildings. The County should ensure that maintenance employees have regular training to complete their tasks especially as technologies advance.

# Appendix A
# List of Scanned and Archived Documents

| File folder | File name | File type | Description |
|---|---|---|---|
| asbuilts | CC Justice Center Planning | pdf | Corrections Center - Level 1/Plaza |
| asbuilts | CC Justice Center Planning | RVT file | Revit |
| asbuilts | CC Justice Center Planning_SF | pdf | Corrections Center - Level 1/Plaza sq ft |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-A01-CORRECTIONSLEVEL1 | dwg | AutoCad |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-A02-CORRECTIONSLEVEL2 | dwg | AutoCad |
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| asbuilts\DWG format original | CC Justice Center Planning-Sheet-G01-COVERSHEET | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-G02-DATASUMMARY | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-G03-DATASUMMARY | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-G04-DATASUMMARY | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-PL-01-PARKINGLEVEL1 | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-PL-02-PARKINGLEVEL2 | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-SP-01-SITEPLANLEVEL1 | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-SP-02-SITEPLANLEVEL2 | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-SP-03-SITEPLANLEVEL3 | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-SP-04-SITEPLANLEVEL4 | PCP | |
| asbuilts\DWG format original | CC Justice Center Planning-Sheet-SP-05-SITEPLANLEVEL5 | PCP | |
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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-005-NJCF0020@20 | PDF | Police Headquarters Second Floor |
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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-007-NJCF0040@20 | PDF | Police Headquarters Fourth floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-008-NJCF0050@20 | PDF | Police Headquarters Fifth Floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-009-NJCF0060@20 | PDF | Police Headquarters Sixth Floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-010-NJCF0070@20 | PDF | Police Headquarters Seventh Floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-011-NJCF0080@20 | PDF | Police Headquarters Eighth Floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-012-NJCF0090@20 | PDF | Police Headquarters Nnth Floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-013-NCHF00SB@20 | PDF | City Hall Sub Basement Plan |

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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-014-NCHF000B@20 | PDF | City Hall Basement Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-015-NCHF0020@20 | PDF | City Hall Second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-016-ND1F0010@20 | PDF | City Hall First Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-017-ND1F0020@20 | PDF | City Hall Second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-018-ND2F0010@20 | PDF | Police Second District Headquarters Lobby level plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-019-ND2F0020@20 | PDF | Police Second District Headquarters Second level plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-020-ND3F0010@20 | PDF | Police Third District Headquarters Partial First Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-021-ND4F0010@20 | PDF | Police Fourth District Headquarters First Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-022-ND4F0020@20 | PDF | Police Fourth Dstrict Headquarters Second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-023-ND5F0010@20 | PDF | Police Fifth District Headquarters First Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-024-ND5F0020@20 | PDF | Police Fifth District Headquarters Second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-025-ND6F0010@20 | PDF | Police Sixth Dstrict Headquarters first Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-026-ND6F0020@20 | PDF | Police Sixth District Headquarters second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-027-NAPF0010@20 | PDF | Cleveland Hopkins lower deplaning Level |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-028-NV1F0010@20 | PDF | Vehicle Processing Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-029-NB1F0010@20 | PDF | Bank One Building / 15th floor Computer Room |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-030-TYP-1@20 | PDF | Justice Center Rack Typicals |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-031-TYP-2@20 | PDF | Rack Typicals District 1-6 |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 008-032-DETAILS@20 | PDF | Details Cleveland Police |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-001-AP-E1@20 | PDF | Police Headquarters Parking Level Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-002-AP-E2@20 | PDF | Police Headquarters Phase 9 Parking Level P-2 Electrical Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-003-AP-E3@20 | PDF | Police Headquarters Phase 9 Parking Level P-2 Electrical Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-004-AP-E4@20 | PDF | Police Headquarters Phase 9 Parking Level P-1  Electrical Plan Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-005-AP-E5@20 | PDF | Police Headquarters Phase 9 First Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-006-AP-E6@20 | PDF | Police Headquarters Phase 9 Second Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-007-AP-E7@20 | PDF | Police Headquarters Phase 9 Third  Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-008-AP-E8@20 | PDF | Police Headquarters Phase 9 Fourth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-009-AP-E9@20 | PDF | Police Headquarters Phase 9 Fifth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-010-AP-E10@20 | PDF | Police Headquarters Phase 9 Sixth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-011-AP-E11@20 | PDF | Police Headquarters Phase 9 Seventh Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-012-AP-E12@20 | PDF | Police Headquarters Phase 9 Eighth Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-013-AP-E13@20 | PDF | Police Headquarters Phase 9 Ninth Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-014-AP-E14@20 | PDF | Police Headquarters Phase 9 First Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-015-AP-E15@20 | PDF | Police Headquarters Phase 9 Second Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-016-AP-E16@20 | PDF | Police Headquarters Phase 9 Third Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-017-AP-E17@20 | PDF | Police Headquarters Phase 9 Fourth Floor Power plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-018-AP-E18@20 | PDF | Police Headquarters Phase 9 Fifth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-019-AP-E19@20 | PDF | Police Headquarters Phase 9 Sixth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-020-AP-E20@20 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-021-AP-E20@20@1 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-022-AP-E21@20 | PDF | Police Headquarters Phase 9 Eighth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-023-AP-E21@20@1 | PDF | Police Headquarters Phase 9 Eighth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-024-AP-E22@20 | PDF | Police Headquarters Phase 9 Ninth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-025-AP-E23@20 | PDF | Police Headquarters Phase 9 Elevator Penthouse |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-026-AP-E24@20 | PDF | Police Headquarters Phase 9 Main Switchgear Room |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-027-AP-E25@20 | PDF | Police Headquarters Phase 9  Riser Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-028-AP-E26@20 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-029-AP-E27@20 | PDF | Police Headquarters Phase 9  Telephone Cabinet |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-030-AP-E28@20 | PDF | Police Headquarters Phase 9  Stairs |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-031-AP-E29@20 | PDF | Police Headquarters Phase 9  Fire Alarm & CCTC Riser Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-032-AP-E1@20@1 | PDF | Police Headquarters Phase 9  Parking Level P-2 Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-033-AP-E2@20@1 | PDF | Police Headquarters Phase 9  Parking Level P-2 Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-034-AP-E3@20@1 | PDF | Police Headquarters Phase 9  Parking Level P-1 Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-035-AP-E4@20@1 | PDF | Police Headquarters Phase 9  Parking Level P-1 Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-036-AP-E5@20@1 | PDF | Police Headquarters Phase 9  First Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-037-AP-E6@20@1 | PDF | Police Headquarters Phase 9  Second Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-038-AP-E7@20@1 | PDF | Police Headquarters Phase 9  Third Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-039-AP-E8@20@1 | PDF | Police Headquarters Phase 9  Fourth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-040-AP-E9@20@1 | PDF | Police Headquarters Phase 9  Fifth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-041-AP-E10@20@1 | PDF | Police Headquarters Phase 9 Sixth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-042-AP-E11@20@1 | PDF | Police Headquarters Phase 9 Seventh Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-043-AP-E12@20@1 | PDF | Police Headquarters Phase 9 Eighth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-044-AP-E13@20@1 | PDF | Police Headquarters Phase 9 Ninth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-045-AP-E14@20@1 | PDF | Police Headquarters Phase 9 First Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-046-AP-E15@20@1 | PDF | Police Headquarters Phase 9 Second Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-047-AP-E16@20@1 | PDF | Police Headquarters Phase 9 Third Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-048-AP-E17@20@1 | PDF | Police Headquarters Phase 9 Fourth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-049-AP-E18@20@1 | PDF | Police Headquarters Phase 9 Fifth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-050-AP-E19@20@1 | PDF | Police Headquarters Phase 9 Sixth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-051-AP-E20@20@2 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-052-AP-E20@20@3 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-053-AP-E21@20@2 | PDF | Police Headquarters Phase 9 Eighth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-054-AP-E21@20@3 | PDF | Police Headquarters Phase 9 Eighth Floor Power Plan |

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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-055-AP-E22@20@1 | PDF | Police Headquarters Phase 9 Ninth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-056-AP-E23@20@1 | PDF | Police Headquarters Phase 9 Elevator Penthouse Plan / Roof Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-057-AP-E24@20@1 | PDF | Police Headquarters Phase 9 Main Switchgear Room |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-058-AP-E25@20@1 | PDF | Police Headquarters Phase 9 One Line Riser Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-059-AP-E26@20@1 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-060-AP-E27@20@1 | PDF | Police Headquarters Phase 9 Telephone Cabinet |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-061-AP-E28@20@1 | PDF | Police Headquarters Phase 9 Stairs |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-062-AP-E29@20@1 | PDF | Police Headquarters Phase 9 Fire Alarm & CCTV Riser Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-063-AP-E1@20@2 | PDF | Police Headquarters Phase 9 Parking P-2 Electrical Plan Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-064-AP-E2@20@2 | PDF | Police Headquarters Phase 9 Parking P-2 Electrical Plan Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-065-AP-E3@20@2 | PDF | Police Headquarters Phase 9 Parking P-2 Electrical Plan Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-066-AP-E4@20@2 | PDF | Police Headquarters Phase 9 Parking P-2 Electrical Plan Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-067-AP-E5@20@2 | PDF | Police Headquarters Phase 9 First Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-068-AP-E6@20@2 | PDF | Police Headquarters Phase 9 Second Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-069-AP-E7@20@2 | PDF | Police Headquarters Phase 9 Third Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-070-AP-E8@20@2 | PDF | Police Headquarters Phase 9 Fourth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-071-AP-E9@20@2 | PDF | Police Headquarters Phase 9 Fifth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-072-AP-E10@20@2 | PDF | Police Headquarters Phase 9 Sixth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-073-AP-E11@20@2 | PDF | Police Headquarters Phase 9 Seventh Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-074-AP-E12@20@2 | PDF | Police Headquarters Phase 9 Eighth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-075-AP-E13@20@2 | PDF | Police Headquarters Phase 9 Ninth Floor Lighting Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-076-AP-E14@20@2 | PDF | Police Headquarters Phase 9 First Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-077-AP-E15@20@2 | PDF | Police Headquarters Phase 9 Second Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-078-AP-E16@20@2 | PDF | Police Headquarters Phase 9 Third Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-079-AP-E17@20@2 | PDF | Police Headquarters Phase 9 Fourth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-080-AP-E18@20@2 | PDF | Police Headquarters Phase 9 Fifth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-081-AP-E19@20@2 | PDF | Police Headquarters Phase 9 Sixth Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-082-AP-E20@20@4 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-083-AP-E20@20@5 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-084-AP-E21@20@4 | PDF | Police Headquarters Phase 9 Seventh Floor Power Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-085-AP-E21@20@5 | PDF | Police Headquarters Phase 9 Eighth Floor Power Plan |
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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-088-AP-E24@20@2 | PDF | Police Headquarters Phase 9 Main Switchgear Room |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-089-AP-E25@20@2 | PDF | Police Headquarters Phase 9 One Line Riser Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-090-AP-E27@20@2 | PDF | Police Headquarters Phase 9 Telephone Cabinet |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-091-AP-E28@20@2 | PDF | Police Headquarters Phase 9 Stairs |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 009-092-AP-E29@20@2 | PDF | Police Headquarters Phase 9 Fire Alarm & CCTV Riser Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-001-AP@20 | PDF | Drawing Index Phase 1-11 |
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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-003-AP-M2@20 | PDF | Police Headquarters Phase 10 Parking Level P-1 Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-004-AP-M3@20 | PDF | Police Headquarters Phase 10 Parking Level P-2 Unit A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-005-AP-N4@20 | PDF | Police Headquarters Phase 10 Parking Level P-2 Unit B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-006-AP-M5@20 | PDF | Police Headquarters Phase 10 First Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-007-AP-M6@20 | PDF | Police Headquarters Phase 10 Second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-008-AP-M7@20 | PDF | Police Headquarters Phase 10 Third Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-009-AP-M8@20 | PDF | Police Headquarters Phase 10 Fourth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-010-AP-M9@20 | PDF | Police Headquarters Phase 10 Fifth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-011-AP-M10@20 | PDF | Police Headquarters Phase 10 Sixth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-012-AP-M11@20 | PDF | Police Headquarters Phase 10 Seventh Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-013-AP-M12@20 | PDF | Police Headquarters Phase 10 Eighth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-014-AP-M14@20 | PDF | Police Headquarters Phase 10 Roof Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-015-AP-M15@20 | PDF | Police Headquarters Phase 10 Partial Fifth Floor Plan A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-016-AP-M16@20 | PDF | Police Headquarters Phase 10 Partial Fifth Floor Plan B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-017-AP-M17@20 | PDF | Police Headquarters Phase 10 Partial Fifth Floor Plan C |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-018-AP-M18@20 | PDF | Police Headquarters Phase 10 Partial Fifth Floor Plan D |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-019-AP-M19@20 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-020-AP-M20@20 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-021-AP-M21@20 | PDF | Police Headquarters Phase 10 Fintube Radiation Diagram East & North Wall Elevation |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-022-AP-M22@20 | PDF | Police Headquarters Phase 10 Fintube Radiation Diagram West & North Wall Elevation |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-023-AP-M23@20 | PDF | Police Headquarters Phase 10 Fintube Radiation Diagram West Wall Elevation Ease Wall Opposite Hand |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-024-AP-M24@20 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-025-AP-M25@20 | PDF | Police Headquarters Phase 10 Fintube Radiation cover for 6th thru 9th Floors |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-026-AP-M27@20 | PDF | Police Headquarters Phase 10 Schedule |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-027-AP-M27A@20 | PDF | Police Headquarters Phase 10 Schedule |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-028-SUPP-AP-M3@20 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-029-SUPP-AP-M4@20 | PDF | Police Headquarters Phase 10 Partial Fifth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-030-SUPP-AP-M5@20 | PDF | Police Headquarters Phase 10 Partial Eighth and Nine Floor |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-031-AP-P1@20 | PDF | Police Headquarters Phase 10 Utilities Plan Parking Level P-1 |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-032-AP-P2@20 | PDF | Police Headquarters Phase 10 Parking Level P-1 UNIT A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-033-AP-P3@20 | PDF | Police Headquarters Phase 10 Parking Level P-1 UNIT B |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-034-AP-P4@20 | PDF | Police Headquarters Phase 10 Parking Level P-2 UNIT A |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-035-AP-P5@20 | PDF | Police Headquarters Phase 10 Parking Level P-2 UNIT B |

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| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-036-AP-P6@20 | PDF | Police Headquarters Phase 10 First Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-037-AP-P7@20 | PDF | Police Headquarters Phase 10 Second Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-038-AP-P8@20 | PDF | Police Headquarters Phase 10 Third Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-039-AP-P9@20 | PDF | Police Headquarters Phase 10 Fourth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-040-AP-P10@20 | PDF | Police Headquarters Phase 10 Fifth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-041-AP-P11@20 | PDF | Police Headquarters Phase 10 Sixth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-042-AP-P12@20 | PDF | Police Headquarters Phase 10 Seventh Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-043-AP-P13@20 | PDF | Police Headquarters Phase 10 Eigth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-044-AP-P14@20 | PDF | Police Headquarters Phase 10 Ninth Floor Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-045-AP-P15@20 | PDF | Police Headquarters Phase 10 Roof Plan |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-046-AP-P16@20 | PDF | |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-047-AP-P17@20 | PDF | Police Headquarters Phase 10 Water and Plumbing Stack Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-048-AP-P18@20 | PDF | Police Headquarters Phase 10 Water and Plumbing Stack Diagram |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-049-AP-P19@20 | PDF | Police Headquarters Phase 10 Plumbing Stack |
| CPMH Scanned Drawings\Police Headquarters Scanned Drawings\Drawings | 010-050-AP-P20@20 | PDF | Police Headquarters Phase 10 Plumbing Stack |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 003-198-AC9-7R1@20@1 | pdf | Mezzanine Level Part 1 Reflected Ceiling Plan |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 004-071-AG7-4@20 | pdf | Vertical Stair Sections A, B, C, D, E, F, and G |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 004-077-AG7-6@20 | pdf | Vertical Sections and Details Stairs K and J |
| Original Drawings 1 of 2\Project\Drawings\PDF | 004-080-AG7-7@20 | pdf | Stairs L and M Plans and Vertical Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 004-083-AG7-8@20 | pdf | Stair Details A, B, C, D, E and G |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 008-060-SC3-1@20 | pdf | Typical Metal Deck Layout Part 1 |
| Original Drawings 1 of 2\Project\Drawings\PDF | 008-062-SC3-2@20 | pdf | Typical Metal Deck Layout Part 2 |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-001-SS1-1@20@1 | pdf | Site Plan Foundation Contract Areas |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-003-SS1-2@20 | pdf | Location Plan Old Existing Piles |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-004-SS2-1@20@1 | pdf | Area 1 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-006-SS2-2@20@1 | pdf | Area 1 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-008-SS2-3@20@1 | pdf | Area 2 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-010-SS2-4@20@1 | pdf | Area 2 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-012-SS2-5@20@1 | pdf | Area 3 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-014-SS2-6@20@1 | pdf | Area 3 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-016-SS2-7@20@1 | pdf | Area 4 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-018-SS2-8@20@1 | pdf | Area 4 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-020-SS2-9@20@3 | pdf | Area 5 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-024-SS2-10@20@3 | pdf | Area 5 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-028-SS2-11@20@3 | pdf | Area 6 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-032-SS2-12@20@3 | pdf | Area 6 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-036-SS2-13@20@3 | pdf | Area 7 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-040-SS2-14@20@3 | pdf | Area 7 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-044-SS2-15@20@3 | pdf | Area 8 Mat Foundation Plan Top Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-048-SS2-16@20@3 | pdf | Area 8 Mat Foundation Plan Bottom Reinforcing |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-052-SS2-17@20@2 | pdf | Foundation Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-055-SS2-18@20@3 | pdf | Area 1 Receiving Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-060-SS2-19@20@3 | pdf | Area 2 Receiving Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-061-SS2-20@20@3 | pdf | Area 1 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-062-SS2-21@20@3 | pdf | Area 2 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-063-SS2-22@20@3 | pdf | Area 1 and 2 Receiving Level Beam Profiles |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-064-SS2-23@20@3 | pdf | Area 1 and 2 Receiving Level Beam Profiles (Con'd) |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-065-SS2-24@20@3 | pdf | Area 1 and 2 Receiving Level Beam Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-066-SS2-25@20@3 | pdf | Area 1 and 2 Plaza Level Beam Profiles |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-067-SS2-26@20@3 | pdf | Area 1 and 2 Plaza Level Beam Profiles (Con'd) |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-068-SS2-27@20@3 | pdf | Area 1 and 2 Plaza Level Beam Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-069-SS2-28@20@3 | pdf | Area 1 and 2 Plaza Level Sections and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-070-SS2-29@20@3 | pdf | Area 1 and 2 Column Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-071-SS2-30@20@3 | pdf | Area 1 and 2 Sheriff's Ramp and Wall Section, Structural Plan and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-072-SS2-32@20@3 | pdf | Area 5 P-1 Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-073-SS2-33@20@3 | pdf | Area 6 P-1 Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-074-SS2-34@20@3 | pdf | Area 7 P-1 Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-075-SS2-35@20@3 | pdf | Area 8 P-1 Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-076-SS2-36@20@3 | pdf | Area 5 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-077-SS2-37@20@3 | pdf | Area 6 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-078-SS2-38@20@3 | pdf | Area 7 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-079-SS2-39@20@3 | pdf | Area 8 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-080-SS2-40@20@3 | pdf | Area 5 to 8 Frame and Wall Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-081-SS2-41@20@3 | pdf | Area 5 to 8 Ramp Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-082-SS2-42@20@3 | pdf | Area 5 to 8 Miscellaneous Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-083-SS2-43@20@3 | pdf | Area 5 to 8 Column Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-084-SS2-44@20@3 | pdf | Area 5 to 8 P-1 Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-085-SS2-45@20@3 | pdf | Area 5 to 8 P-1 Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-086-SS2-46@20@3 | pdf | Area 5 to 8 Plaza Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-087-SS2-47@20@3 | pdf | Area 5 to 8 Plaza Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-088-SS2-48@20@3 | pdf | Area 5 to 8 Plaza Level Beam Schedule and Details |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 009-116-SS2-28@20 | pdf | Area 1 and 2 Plaza Level Sections and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-119-SS2-29@20 | pdf | Area 1 and 2 Column Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-122-SS2-30@20 | pdf | Area 1 and 2 Sheriff's Ramp and Wall Section, Structural Plan and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-125-SS2-32@20 | pdf | Area 5 P-1 Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-128-SS2-33@20 | pdf | Area 6 P-1 Level Structural Framing Plan |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 009-140-SS2-37@20 | pdf | Area 6 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-143-SS2-38@20 | pdf | Area 7 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-146-SS2-39@20 | pdf | Area 8 Plaza Level Structural Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-149-SS2-40@20 | pdf | Area 5 to 8 Frame and Wall Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-152-SS2-41@20 | pdf | Area 5 to 8 Ramp Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-155-SS2-42@20 | pdf | Area 5 to 8 Miscellaneous Sections |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-158-SS2-43@20 | pdf | Area 5 to 8 Column Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-161-SS2-44@20 | pdf | Area 5 to 8 P-1 Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-164-SS2-45@20 | pdf | Area 5 to 8 P-1 Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-167-SS2-46@20 | pdf | Area 5 to 8 Plaza Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-170-SS2-47@20 | pdf | Area 5 to 8 Plaza Level Beam Schedule and Details |
| Original Drawings 1 of 2\Project\Drawings\PDF | 009-173-SS2-48@20 | pdf | Area 5 to 8 Plaza Level Beam Schedule and Details |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 010-002-SG2-1@20@1 | pdf | Mezzanine Level Steel Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 010-006-SG2-2@20@1 | pdf | Level L-1 Steel Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 010-008-SG2-3@20@1 | pdf | Level L-2 Steel Framing Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 010-011-SG2-4@20@1 | pdf | Level L-3 Steel Framing Plan |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 010-025-SG2-9@20 | pdf | Skylight Frame Steel Framing Plan |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 011-001-U-1@20 | pdf | Site Utility Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 011-002-U-2@20 | pdf | Parking Level 1 Misc. Plumbing and Fire Protection |
| Original Drawings 1 of 2\Project\Drawings\PDF | 011-003-U-3@20 | pdf | Parking Level 1 Electrical |
| Original Drawings 1 of 2\Project\Drawings\PDF | 011-004-U-4@20 | pdf | 11.5KV Service to Charles-Mott and Administration Buildings |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-003-HT-1@20 | pdf | Plaza Level HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-004-HT-2@20 | pdf | Mezzanine Level HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-005-HT-3@20 | pdf | Level 1 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-006-HT-4@20 | pdf | Level 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-007-HT-5@20 | pdf | Level 3 Below 16'-0" HVAC Reference Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-008-HT-6@20 | pdf | Level 3 Above 16'-0" HVAC Reference Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-009-HT-7@20 | pdf | Level 4 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-010-HT-8@20 | pdf | Level 5 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-011-HT-9@20 | pdf | Level 6 HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-016-HT-14@20 | pdf | Level 11, 12, 14-19 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-017-HT-15@20 | pdf | Level 13, 20, 21, and 22 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-018-HT-15-5@20 | pdf | Level 23 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-019-HT-16@20 | pdf | Level 24 HVAC Reference Plan |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-021-HT-18@20 | pdf | Roof Plan HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-022-HT-19@20 | pdf | Level 3 Section A Below 16'-0" HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-031-HT-28@20 | pdf | Level 3 Connecting Link West HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-035-HT-32@20 | pdf | Level 24 Section D HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-036-HT-33@20 | pdf | Level 3 Equipment Room Vertical Sections HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-037-HT-34@20 | pdf | Level 3 Equipment Room Vertical Sections HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-038-HT-35@20 | pdf | Level 24 Equipment Room Vertical Sections HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-041-HT-38@20 | pdf | Mechanical Shafts Horizontal Sections HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 012-043-HT-39@20 | pdf | Mechanical Shafts Horizontal Sections HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-047-HT-42@20 | pdf | Mechanical Shafts Horizontal Sections HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-049-HT-44@20 | pdf | Cabinet Details HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 012-055-HT-50@20 | pdf | Secondary Water Piping HVAC Schematic |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-001-HC-0-8@20 | pdf | Parking Level Part 1 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-002-HC-0-9@20 | pdf | Parking Level Part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-003-HC-1@20 | pdf | Receiving Level Part 1 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-004-HC-2@20 | pdf | Receiving Level Part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-005-HC-3@20 | pdf | Plaza Level Part 1 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-006-HC-4@20 | pdf | Plaza Level part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-007-HC-5R@20 | pdf | Mezzanine Level Part 1 HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-009-HC-7@20 | pdf | Level 1 Part 1 HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-012-HC-10@20 | pdf | Level 2 Part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-013-HC-11@20 | pdf | Level 3 Parts 1 and 2 HVAC Reference Plan |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-014-HC-11-5@20 | pdf | Level 3 Connecting Link HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-017-HC-14@20 | pdf | Level 5 Part 1 HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-019-HC-16@20 | pdf | Level 6, 9 Part 1 HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-022-HC-19@20 | pdf | Level 7 and 10 Part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-023-HC-19-2@20 | pdf | Level 8 Part 1 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-024-HC-19-4@20 | pdf | Level 8 Part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-025-HC-19-6@20 | pdf | Level 11 Part 1 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-026-HC-19-8@20 | pdf | Level 11 Part 2 HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-027-HC-19-9@20 | pdf | Roof Plan HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-028-HC-20@20 | pdf | Level 3 Section A HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-029-HC-21@20 | pdf | Level 3 Section B HVAC |
| Original Drawings 1 of 2\Project\Drawings\PDF | 013-030-HC-22@20 | pdf | Level 3 Section C HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-034-HC-26@20 | pdf | Schedules HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 013-039-HC-31@20 | pdf | Details HVAC |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 014-004-HG2-3@20 | pdf | Galleria HVAC Plan Mezzanine Level |
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| Original Drawings 1 of 2\Project\Drawings\PDF | 024-003-EG2-3@20 | pdf | Galleria Lighting and Power Plan Mezzanine Level Floor Elev. 668'-0" |
| Original Drawings 1 of 2\Project\Drawings\PDF | 024-004-EG2-4@20 | pdf | Galleria Lighting Plan Level L-1 Floor Elev. 681'-0" |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 055-002-A-2@20@5 | pdf | Jail II First Floor Plan |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 055-007-A-7@20@4 | pdf | Jail II Floor Plan 6, 8, 10 and 12 |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 055-011-FP-3@20 | pdf | Fire Protection Basement Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 055-012-FP-4@20 | pdf | Fire Protection First Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 055-013-P-2@20@1 | pdf | Plumbing Basement Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 055-014-P-3@20 | pdf | Plumbing First Floor Plan |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 055-016-P-5@20 | pdf | Plumbing Third Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 055-017-P-6@20 | pdf | Plumbing 4th Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 055-018-P-7@20 | pdf | Plumbing Floor Plan 5, 7, 9 and 11 |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 056-007-2-03@20@1 | pdf | Typical Gutter Liner Detail @ East Gutter w/E.J. at Wall (North End) |
| Original Drawings 2 of 2\Project\Drawings\PDF | 056-008-2-04@20@1 | pdf | Typical North Gutter Liner Wall E.J. Isometric Detail @ N.E. Corner |
| Original Drawings 2 of 2\Project\Drawings\PDF | 056-009-2-05@20@1 | pdf | Typical North Gutter Liner Wall E.J. Isometric Detail @ N.W. Corner |
| Original Drawings 2 of 2\Project\Drawings\PDF | 056-010-2-06@20 | pdf | Typical East Gutter Liner @ Wall E.J. Isometric Det. @ North End |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 057-012-3-02@20@1 | pdf | Ground Floor Cross Sections and Details |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 061-029-M-1@20@6 | pdf | First Floor HVAC Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-030-M-2@20@6 | pdf | Second Floor HVAC Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-031-M-3@20@5 | pdf | Third Floor HVAC Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-032-M-4@20@2 | pdf | HVAC Details and Partial Plans |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-033-E-1@20@7 | pdf | Electrical Fixture Schedule and Symbol Legend |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-034-E-2@20@7 | pdf | First Floor Electrical Demolition Plan and Temporary Electrical Plan for Phase 3A |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-035-E-3@20@5 | pdf | Second Floor Electrical Demolition Plan and Temporary Electrical Plan for Phase 3B |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-036-E-4@20@4 | pdf | Third Floor Leectrical Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-037-E-5@20@3 | pdf | Partial First Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-038-E-6@20@3 | pdf | Partial Second Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-039-E-7@20@1 | pdf | Partial Third Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-040-E-8@20@1 | pdf | Partial First Floor Power and Communications Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-041-E-9@20@1 | pdf | Partial Second Floor Power and Communication Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-042-E-10@20@1 | pdf | Partial Third Floor Power and Communications Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-043-E-11@20@1 | pdf | Electrical Risers and Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-044-IBM-1@20 | pdf | Cover Page- Jail 1 Riser Cable Plan Project 2 |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-045-IBM-2@20 | pdf | Parking Level 1 Data Cable Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-046-IBM-3@20 | pdf | First Floor Data Cable Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-047-IBM-4@20 | pdf | Second Floor Data Cable Plan |

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| Original Drawings 2 of 2\Project\Drawings\PDF | 061-048-IBM-5@20@1 | pdf | Third Floor Data Cable Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-049-IBM-5@20 | pdf | Third Floor Data Cable Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-050-IBM-6@20@1 | pdf | 4th Floor Data Cable Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-051-IBM-6@20 | pdf | 4th Floor Data Cable Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-052-IBM-7@20@1 | pdf | Rack Typical Drawings |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-053-IBM-7@20 | pdf | Rack Typical Drawings |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-054-IBM-8@20@1 | pdf | Detail Drawings |
| Original Drawings 2 of 2\Project\Drawings\PDF | 061-055-IBM-8@20 | pdf | Detail Drawings |
| Original Drawings 2 of 2\Project\Drawings\PDF | 062-001-E-1R@20 | pdf | Electrical Fixture Schedule and Symbol Legend |
| Original Drawings 2 of 2\Project\Drawings\PDF | 062-002-E-4R@20 | pdf | Third Floor Electrical Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 062-003-E-7R@20 | pdf | Third Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 062-004-E-10R@20 | pdf | Thrid Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 062-005-E-11R@20 | pdf | Electrical Risers and Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 062-006-JAIL-1--SUPPORT-SERVICES-PROJECT---120-HOLDING-UNIT@20 | pdf | Corrections Center Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-001-TS-1@20 | pdf | Cover Page- Justice Center Correction Center Second Bidding Electrical Trades Rebid |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-002-TS-2@20 | pdf | Title Sheet and Drawing Index |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-003-A1-0@20 | pdf | Phasing Schedule |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-004-A1-1@20 | pdf | Construction Phasing Plans |
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| Original Drawings 2 of 2\Project\Drawings\PDF | 063-006-A1-3@20 | pdf | Construction Staging Plans Receiving Sallyport |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-007-A2-1@20 | pdf | First Floor Demo Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-008-A2-3@20 | pdf | 6th Floor Demo Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-009-A2-4@20 | pdf | 7th Floor Demo Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-010-A2-5@20 | pdf | 8th Floor Demo Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-011-A2-6@20 | pdf | 9th Floor Demo Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-012-A2-7@20 | pdf | 10th Floor Demo Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-013-A3-1@20 | pdf | New First Floor Plan Door and Finish Schedules |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-014-A3-2@20 | pdf | 5th Floor HVAC Pad Layout |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-015-A3-3@20 | pdf | New Sixth Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-016-A3-4@20 | pdf | New 7th Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-017-A3-5@20 | pdf | New 8th Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-018-A3-6@20 | pdf | New 9th Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-019-A3-7@20 | pdf | New 10th Floor Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-020-A4-1@20 | pdf | Smoke Control Plans |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-021-A4-2@20 | pdf | 8th and 9th Floor Secutiry/ Smoke Control Plans |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-022-A4-3@20 | pdf | 10th Floor Security/ Smoke Control Plans |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-023-A5-3@20 | pdf | 6th Floor Common Area Reflected Ceiling Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-024-A5-4@20 | pdf | 7th Floor Common Area Reflected Ceiling Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-025-A5-5@20 | pdf | 8th Floor Common Area Reflected Ceiling Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-026-A6-0@20 | pdf | Typical Interior Elevation Notes and Furniture Identification Key |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-027-A6-1@20 | pdf | Enlarged Floor Plan reflected Ceiling Plan and Interior Elevations at First Floor Visitation |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-028-A6-2@20 | pdf | Enlarged Plan at Pod 6A Medical Administration |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-029-A6-3@20 | pdf | Enlarged Plan at Pod 6B Male Medical Level 1 |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-030-A6-3A@20 | pdf | Enlarged Plan at Medical Level 1 Isolation Rooms |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-031-A6-3B@20 | pdf | Enlarged Plan at Medical Casework |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-032-A6-4@20 | pdf | Enlarged Plan at 6th Floor Medical Records |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-033-A6-5@20 | pdf | 6th Floor Male Medical Exam |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-034-A6-6@20 | pdf | Enlarged Plan at 6th Floor Female Medical Exam |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-035-A6-7@20 | pdf | Enlarged Plan at PODS G1 and G2 Female Medical Level 1 and 2 |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-036-A6-8@20 | pdf | Enlarged Plan at 6th and 7th Floor Visitation |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-037-A6-9@20 | pdf | 7th Floor South |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-038-A6-10@20 | pdf | Typical Housing Pod |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-039-A6-11@20 | pdf | Enlarged Plan At 7th Floor Dormitory |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-040-A6-12@20 | pdf | Enlarged Plan at 8th and 10th Floors North and South |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-041-A6-13@20 | pdf | Enlarged Plan at 9th Floor North |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-042-A6-14@20 | pdf | Enlarged Plan at 9th Floor Visitation |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-043-A6-15@20 | pdf | Enlarged Plan at 4th Floor Master Control |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-044-A6-16@20 | pdf | Enlarged Plan at 7th and 9th Floor Control Rooms |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-045-A6-17@20 | pdf | Enlarged Plan at 6th, 8th, and 10th Floor Control Rooms |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-046-A6-18@20 | pdf | 6th, 7th, 8th, 9th and 10th Floor Door Control Panels |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-047-A6-19@20 | pdf | Master Control Door and Elevator Control Panels |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-048-A6-20@20 | pdf | Door Control Cabinets at Typical Inmate Housing Pod |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-049-A8-1@20 | pdf | Building Section |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-050-A8-2@20 | pdf | First Floor Visitation Sections and Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-051-A8-3@20 | pdf | Typical Wall Sections |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-052-A8-4@20 | pdf | Hollow Metal Details, Misc. Door Jamb Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-053-A8-5@20 | pdf | Typical Correctional Furniture and Misc. Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-054-A8-6@20 | pdf | Misc. Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-055-A9-1@20 | pdf | Door Schedule and Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-056-A9-2@20 | pdf | Door Schedule |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-057-A9-3@20 | pdf | Power Sliding Door Details and Sections |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-058-A9-4@20 | pdf | Room Finish Schedule Floors 6 and 7 |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-059-A9-5@20 | pdf | Room Finish Schedule Floors 8, 9, 10 |

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| Original Drawings 2 of 2\Project\Drawings\PDF | 063-060-M2-1@20@2 | pdf | 5th Floor Demo Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-061-M2-2@20@2 | pdf | 6th Floor Demo Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-062-M2-3@20@1 | pdf | 7th Floor Demo Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-063-M2-4@20@1 | pdf | 8th Floor Demo Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-064-M2-5@20@1 | pdf | 9th Floor Demo Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-065-M2-6@20@1 | pdf | 10th Floor Demo Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-066-M3-1@20@1 | pdf | New 5th Floor Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-067-M3-2@20@1 | pdf | New 6th Floor Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-068-M3-3@20 | pdf | New 7th Floor Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-069-M3-4@20 | pdf | New 8th Floor Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-070-M3-5@20 | pdf | New 9th Floor Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-071-M3-6@20 | pdf | New 10th Floor Plan Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-072-M3-7@20 | pdf | Plumbing Stack Diagrams and Riser Diagrams Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-073-M3-8@20 | pdf | Plumbing Stack Diagrams and Riser Diagrams Plumbing and Fire Protection |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-074-M1-1@20@2 | pdf | HVAC Equipment Schedule Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-075-M2-7@20@1 | pdf | 5th Floor Demo Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-076-M2-8@20@1 | pdf | 6th Floor Demo Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-077-M2-9@20@1 | pdf | 7th Floor Demo Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-078-M2-10@20@1 | pdf | 8th Floor Demo Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-079-M2-11@20@1 | pdf | 9th Floor Demo Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-080-M2-12@20@1 | pdf | 10th Floor Demo Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-081-M4-1@20@1 | pdf | First Floor Demo and New Work Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-082-M4-2@20@1 | pdf | New 5th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-083-M4-3@20@1 | pdf | New 6th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-084-M4-4@20@1 | pdf | New 7th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-085-M4-5@20 | pdf | New 8th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-086-M4-6@20 | pdf | New 9th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-087-M4-7@20 | pdf | New 10th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-088-M4-8@20 | pdf | New Penthouse Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-089-M4-9@20 | pdf | Existing First Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-090-M4-10@20 | pdf | Existing Second Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-091-M4-11@20 | pdf | Existing Third Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-092-M4-12@20 | pdf | Existing 4th Floor Plan Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-093-M4-13@20 | pdf | New HVAC Details Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-094-M-4-14@20 | pdf | New HVAC Details Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-095-M4-15@20 | pdf | Supply Air Riser Diagrams Heating and Air Conditioning |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-096-E1-1@20@1 | pdf | Symbol Legend and Lighting Fixtures Schedule |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-097-E2-1@20@1 | pdf | Partial First Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-098-E2-2@20 | pdf | 4th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-099-E2-3@20 | pdf | 5th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-100-E2-4@20 | pdf | 6th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-101-E2-5@20 | pdf | 7th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-102-E2-6@20 | pdf | 8th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-103-E2-7@20 | pdf | 9th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-104-E2-8@20 | pdf | 10th Floor Demolition Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-105-E3-1@20@1 | pdf | First Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-106-E3-2@20 | pdf | 4th Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-107-E3-3@20 | pdf | 6th Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-108-E3-4@20 | pdf | 7th Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-109-E3-5@20 | pdf | 8th Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-110-E3-6@20 | pdf | 9th Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-111-E3-7@20 | pdf | 10th Floor Lighting Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-112-E4-1@20@1 | pdf | Partial First Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-113-E4-2@20 | pdf | 4th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-114-E4-3@20 | pdf | 5th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-115-E4-4@20 | pdf | 6th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-116-E4-5@20 | pdf | 7th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-117-E4-6@20 | pdf | 8th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-118-E4-7@20 | pdf | 9th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-119-E4-8@20 | pdf | 10th Floor Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-120-E4-9@20 | pdf | Roof/Penthouse Power Plan |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-121-E5-1@20@1 | pdf | One Line Diagram |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-122-E5-2@20 | pdf | CCTV Riser Diagram |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-123-E5-3@20 | pdf | P.A./Intercom System Riser Diagram |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-124-E5-4@20 | pdf | Watch Tour Systems Riser Diagram |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-125-E5-5@20 | pdf | Visitation Telephone System Riser Diagram |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-126-E5-6@20 | pdf | Wring Diagrams |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-127-E5-7@20 | pdf | Panel Schedules |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-128-E6-1@20 | pdf | Misc. Details |
| Original Drawings 2 of 2\Project\Drawings\PDF | 063-129-E6-2@20 | pdf | Lighting Fixture Details |

# Appendix B
# Copy of RFQ Text Provided to County for CMMS System

## CAPITAL ASSET MANAGEMENT SOFTWARE CONSIDERATIONS

Our team provided the County criteria to be considered to obtain a comprehensive enterprise solution. The team focused on an asset management software solution that could be created or adapted from one of many programs available on the market. There are several options available based upon need, usage, depth, implementation, and integration with other ERP systems. Below is the summary of criteria for a software solution:

<u>Purpose of Software:</u> To aid in the planning of predictive and preventative maintenance and facility capital asset replacement.

Provide a capital asset management and planning software application, either hosted by Cuyahoga County or the Vendor, for managing facilities condition information. The proposed system should be capable of accepting existing data from Cuyahoga County in addition to or in place of facilities assessment information provided by the County's Vendors. At a minimum, the asset management software system shall be a fully integrated facility condition assessment system, facility sub-element asset inventory system, and capital asset planning/replacement system that is capable of providing standard and customized management reports. At project completion, the software shall be fully loaded with all FCA data, inventory, maintenance, repair and replacement (MR&R) cost estimates with resulting recommendations for repair and replacement work moving forward over the term of a five-year period.

Provide training to County staff on the use of the capital asset management and planning software such that they will be capable to take over daily operations and perform on-going data updates.

### Requirements for the Capital Asset Management Software

The Vendor should provide a software application, preferably web-based, for managing the facilities inventory and condition database. This system shall provide both tabular and graphical reports. Options for hosting shall be proposed by the Vendors. The proposed system should be capable of accepting existing baseline data and previous condition assessment data for selected buildings from County in addition to or in place of condition assessment information provided by the County's Vendors.

The facility asset management software system should support the key functional concepts and include the preferred features outlined below:

1. Ability to identify sub-elements by both name and or number, without limitation to the end user.
2. Ability to categorize sub-elements using the naming conventions outlined in the "Standard Classification for Building Elements and Related Sitework-UNIFORMAT II".
3. Ability to link sub-elements to a building, and buildings to a site.
4. Sites must be able to be linked in any number of hierarchical levels, (district, city, state, etc.) all the way to the building owner.
5. Cost estimating system embedded within the software. Costs based upon RSMeans® Unit Costs, including local City Costs Indices. Costs shall automatically update annually.

6. Calculates a condition index (CI) for building sub-elements based on Engineered Management System principles. Able to roll up condition indices to buildings and campuses using dollar-weighted averaging of sub-element CIs.
7. Generates maintenance, repair and replacement (MR&R) budget estimates from financial analyses at the sub-element level that rolls up to a building and/or campus. Analysis tools able to generate reports of deferred maintenance backlog and capital renewal requirements over a defined time frame. The system should be capable of analyzing and projecting funding for time periods up to 25 years.
8. Stores and presents the most current condition information to the user through the application interface. Current and historical information should be accessible throughout the life cycle of each sub-element in the inventory.
9. Enables the planning, development and prioritization of facility repair and replacement projects. Completed work should be able to be documented for future reference.
10. Data updates that document repair of sub-element deficiencies shall automatically update current CI for each sub-element.
11. Enables the estimation of project costs based on current local market conditions and permit flexibility in costing based on procurement.
12. Generates both standard and customizable reports that can easily be printed or converted into data files. The application should include both graphical and tabular reporting mechanisms.
13. Forecasts the remaining useful economic service life of each sub-element based on its condition.
14. Calculates sub-element salvage value
15. Uses design life data taken from industry standard reference sources, such as BOMA, ASHRAE, IFMA, etc.
16. Vendor to describe the software's capability of providing life cycle cost analysis for building systems and building types.
17. Vendor to describe their policies and practices associated with Client groups only purchasing components of the Vendor's software packages. Furthermore, describe how other software components can be added at a date and time in the future.
18. Vendor to describe the software's ability to capture energy utilization for each property and the integration that may need to occur with a particular building management system or current County program. Software to have the ability to analyze the utilization for an extended period of time.
19. Vendor to provide description how their software integrates with the County's current programs (county to input what they have now) as well as other common off the shelf programming, building automation systems, etc.

The system may also have additional functionality that could be utilized by the County over time. The Vendor should provide a description of each of the following optional functions that are part of their system:

1. Templates for self-assessing the County's assets using County employees.
2. Compliance review reminder dialog boxes that alert the user when common inspections are required according to various rules and regulations in the State of Ohio. (e.g. elevator inspection, boiler inspection, fire alarm, fire extinguishers, fire sprinkler system, etc.)

3. Software to store and track the County's multitude of vendors that service the County's assets. In addition define any level of automation that would notify a vendor of a scheduled maintenance requirement thru the software or common email program.
4. Maintenance protocols associated with the software as well as the ability to customize protocols.
5. Mobility functions of the software and offering of handheld device options that support the software.
    a. Devices should have a GPS function for tracking. Describe if the device has the capability of sending an automatic predetermined alarm to a central station.
6. Inventory tracking of County furniture, fixtures, and equipment using County's current bar coding system.
7. Space utilization within the County's assets in terms of use, occupancy, duration, and projected need.
8. Vendor to provide any other capabilities of the software not otherwise already requested.

The facility asset management software system requested as part of this RFQ should meet the software design requirements and support the operational features outlined below:

1. Software should be Backnet compatible.
2. Architected software application that stores and manages operational data within a standard relational database management system.
3. The database management system should provide features for partitioning, scalability, recoverability, mirroring, and availability to meet operational requirements.
4. Accessible over the Internet with 24/7 access and operational capability.
5. Access for unlimited end users.
6. Data storage capability for data on all facilities as well as historical back-ups.
7. Recoverability – designed to facilitate business continuity in the event of problem.
8. The user interface should be the primary application design center and support delivery of all user application functions.
9. The user interface should include graphical “point and click” capabilities consistent with common standards for graphical user interface design.
10. User-friendly, with online, contextual help.
11. Response time conducive to maximizing user satisfaction.
12. Provides ability for the County to customize by adding data fields and generate ad hoc reports. Appropriate interfaces to off-the-shelf tools, including:
    - Microsoft Word (correspondence)
    - Microsoft Excel
    - Adobe .pdf files
    - AutoCAD (drawings)
    - Photos
13. The software should provide role-based security that includes:
    - Distributed security administration for user access management.
14. The system should provide an audit trail or log of data access that records the history of data access and change by individual user.

15. Able to export data to standard relational database structure, as well as Computerized Maintenance Management Systems (CMMS) and Computer-Aided Facilities Management Systems.
16. The software design and open interfaces should provide for a variety of read-only data access methods to support reporting and extracting data. Standards-based interfaces to be provided by Vendor. Data dictionary access should be available through similar open, published interfaces.
17. Operational services within application functions should be available through open, published interfaces to support application integration through controlled system functions.

For a hosted application, the following items should be addressed:
1. Service Level Agreement: Provide a Service Level Agreement that ensures the vendor is responsive to County
2. Ownership of data: County retains ownership of all data. Vendor shall describe its understanding of this requirement and how this is accomplished.
3. Disposition of County data upon expiration or termination of contract. Vendor shall describe its understanding of this requirement and how this is accomplished.
4. Protection of County data and data breaches. Explain how Vendor protects information, procedures for notification to the County of unauthorized data access, report of breaches for the past 12 months, indemnification and vendor responsibility for damages, claims, fines, etc. if breach is due to Vendor error or omission.
5. Location of County data. Vendor must state that all County data is stored within the United States of America and is subject to U.S. law.
6. Requests for data. Provide procedure for notification to County of all legal/governmental requests for access to County data.
7. Infrastructure security. Provide overview of business continuity plan, data encryption, and physical security of vendor's data center.

**Requirements for Software Training**
Vendor shall provide training describing the capital asset management software functionality, operational use, data management requirements and data analysis methods necessary to maintain the FCA data in a "current" state. Please attach brief description of available training courses for each proposed application.

Vendor shall provide appropriate training tools, manuals, guidebooks, as necessary to support the training courses.

Vendor shall provide end-user documentation of how to use and operate the software.

**Software Maintenance, Support and Training**: It is intended that the Vendor supply post-installation services necessary to maintain the software in a fully functional, current state, and that County staff be trained to properly use and maintain the software going forward.

1. Software Maintenance and Support: Where applicable, an explanation of the source, level and timing, and frequency for upgrades to the software, plus other services provided as part of the Vendor's software maintenance and support services.



2. Warranties: The Vendor must describe its warranties for the software products and services, including modifications, customizations, interfaces, conversions, and any third party products and services they propose as detailed above.
3. Price Protection: Vendors shall describe any price protection guarantees for maintenance and enhancement and post-installation fees. (e.g., increase in annual maintenance fees will not exceed 2% of the previous year's cost).
4. Support Period: Indicate the duration of the Vendor's support services agreement, and describe any limitations regarding the provided services.
5. Training: Vendor shall describe the training programs included in the proposal. Describe the location of the training. Identify specific training included in proposal versus additional training County may seek for its employees. Describe and provide separate prices for training and educational programs for County personnel in the use, care and maintenance of any proposed software and any associated assessment tools/processes that were used to develop the building condition assessment database. Indicate locations, cost and recommended participant (e.g., management, operators, programmers or others) for each course. Indicate the cost for training in Part II of the Vendor's proposal.
6. Manuals/Training Guides: Vendor shall describe all documentation included for its software system.

**Deliverable F - Software Implementation**

If vendors proposed implementation of the capital asset management software is to install on County's IT infrastructure, then Vendor shall provide information for the following:

1. Site Preparation and Requirements: If the Vendor proposes to install its software on County's IT infrastructure, describe the installation requirements and site services required, including environmental conditions in this proposal section. The Vendor is responsible to provide all the information necessary for a proper site preparation for the electronic system.
2. Support: Indicate the number of Vendor supplied technical support days which are included in the proposal for the initial installation and setup of the capital asset management software at County facilities.
3. Software: All operating systems, applications, utilities, and other software that is required to operate the proposed condition assessment system must be included. The Vendor shall name and describe the function of this software.
4. Hardware Requirements: Vendor shall give a detailed description of any Hardware required, both server and client to operate their proposed solution.

If Vendor's proposed implementation of the capital asset management software is a hosted solution, Vendor shall provide information describing such services. At a minimum, Vendor shall provide information for the following:

1. Name and Location of Hosting Services provider
    a. Requirements to Access the system
    b. Description of the physical features of the hosting environment
    c. Maintenance and support services included
    d. Security provided

2. Hardware and software provided
    a. Data Storage capacity and/or limitations
    b. Speed of network access
    c. Operating system and database software provided

3. Network support services
    a. Availability
    b. Downtime
    c. Issue Response
    d. Maintenance
    e. Backup and Disaster Recovery

**Software License, Maintenance and Support Agreements**

Proposals shall include a copy of all software license agreements and software maintenance and support agreements for Vendor’s proposed products with their response. **Identify if proposed license is an annual license or perpetual license.**

GIS. The County already has an established GIS department that performs geospatial services for the County. The selected Vendor may be requested to assist the County with, including, but not limited to, the following:

1. Enterprise GIS support for geospatial database and application design, development, and implementation.
2. Enterprise GIS support for systems integration with asset management software and databases.

# Appendix C
# Utility Analysis

## UTILITY ANALYSIS

The Justice Center Complex, including the Cleveland Police Headquarters use district steam, district chilled water, electricity, and natural gas1. The 2012 utility cost was $4,351,698 for the Justice Center Complex and $1,164,512 for Jail II. The City of Cleveland provides water and the Northeast Ohio Regional Sewer District (NEORSD) provides sewer to all buildings.

Since its original construction, the Courts Tower, Corrections Center (Jail I), and Atrium have used district steam provided by Cleveland Thermal to meet all building heating needs. The Cleveland Police Headquarters and Jail II were originally served by steam boilers. The steam main is routed through the Parking Garage up to the 5th floor mechanical equipment room (MER) where it is distributed to the Courts Tower, Jail I, and the Cleveland Police Headquarters Building.

Originally, the Courts Tower, Atrium, and Corrections Center (Jail I) were cooled by two (2) steam absorption chillers and a steam turbine chiller installed in the penthouse mechanical equipment room (MER) of the Courts Tower. Chiller condenser heat was rejected by a four-cell cross flow cooling tower on the roof adjacent to the penthouse MER. The condenser water pumps and primary chilled water pumps serving the original cooling plant were installed in the 24th floor MER just below the penthouse MER. The original cooling plant equipment serving the Justice Center Complex was abandoned in place in 1993, when the County signed a contract to purchase chilled water from Cleveland Energy Resources, now Cleveland Thermal.

In 2002, Cuyahoga County converted Jail II to district steam and chilled water from Cleveland Thermal. The County's contract with Cleveland Thermal expires on December 31, 2013. The Cleveland Police Headquarters Building was originally served by boilers and chillers, however today it obtains chilled water and steam from Cleveland Thermal.

Energy Use Index (EUI) is a measure of the intensity of a facility's energy use in terms of total energy consumption from all sources per square foot per year (kBtu/ft2). It is often used to compare the energy consumption of facilities that have similar functions and is a good indicator of the energy efficiency of a facility in relative terms. The U.S. Department of Energy (DOE) has developed a series of benchmark models to help establish a EUI representation of different building types in different geographic areas. Although a "jail" category does not exist in DOE benchmark models, the table below identifies various building type EUI's and cost/gsf data for reference. Benchmark data was taken from the Energy Information Administration's (EIA) Commercial Building Energy Consumption Survey (CBECS) database, specifically for the building types shown below in the 5A climate region.

[1] Natural gas is used for a generator supporting the Cleveland Police Headquarters during an emergency. The generator is housed on top of Courts Tower.

| CBECS Benchmark Data in Climate Zone 5A | | |
|---|---|---|
| **Building Type** | **Average EUI (kBtu/gsf)** | **Average Energy Cost/gsf** |
| **College*** | 132 | $1.81 |
| **Hospital*** | 272 | $2.72 |
| **Office*** | 116 | $1.88 |
| **Medical Office*** | 101 | $1.61 |
| **Warehouse*** | 77 | $1.02 |
| **Dormitory*** | 110 | $1.27 |

***Source: http://buildingsdatabook.eren.doe.gov/CBECS.aspx***

# 1. Buildings: Justice Center Complex (Court Tower, Jail 1 and Atrium)

Utility data for the Justice Center Complex was compiled for electricity, chilled water, steam, water, and sewer for the 5 year period between 2008 and 2012. The Justice Center Complex includes the Court Tower, Atrium, and Corrections Center (Jail 1) buildings. The floor area of the Parking Garage was omitted from the analysis, since it represents a relatively large area with minimal energy consumption that skews the overall energy use intensity (EUI) downward.

## 1.1. Consumption

| JUSTICE CENTER COMPLEX ANNUAL UTILITY CONSUMPTION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **Electricity kWh (1)** | **Steam MLB** | **CHW Ton-Hour** | **CDD** | **HDD** | **Total Energy kbtu** | **Gross Floor Area gsf** | **Energy Use Intensity kbtu/gsf** | **Water / Sewer mcf** |
| 2008 | 20,584,946 | 67,212 | 2,785,196 | 757 | 6,116 | 183,909,316 | 1,153,885 | 159 | 7,811 |
| 2009 | 22,261,949 | 64,176 | 2,613,415 | 657 | 5,864 | 183,944,894 | 1,153,885 | 159 | 7,856 |
| 2010 | 17,142,016 | 68,403 | 3,008,834 | 1,136 | 5,604 | 176,267,749 | 1,153,885 | 153 | 7,686 |
| 2011 | 17,601,512 | 64,150 | 2,997,333 | 962 | 5,644 | 172,619,455 | 1,153,885 | 150 | 8,222 |
| 2012 | 18,990,403 | 51,425 | 2,940,238 | 1,066 | 5,057 | 161,479,561 | 1,153,885 | 140 | 8,975 |
| **Average** | **19,316,165** | **63,073** | **2,869,003** | **915** | **5,657** | **175,644,195** | **1,153,885** | **152** | **8,110** |

(1) Includes 2008 and 2009 Jail II electricity data.

The Justice Center Complex has reduced its EUI by 12% from 2008 to 2012. This corresponds to decreased electric and steam consumption over the same year span. However, the EUI value of 140 in 2012 is significantly above the average EUI for an office (116) or dormitory (110). Additionally, the energy consumption of the Justice Center Complex is 30% higher than Jail II on a per square foot basis. This is likely due to the very high density occupancy, poor building envelope, and the age and condition of the building and its systems.

## 1.2. Cost

| JUSTICE CENTER COMPLEX ANNUAL UTILITY COST | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Electricity (1)** | **Steam** | **Chilled Water** | **Natural Gas** | **Water** | **Sewer** | **Total Energy** | **Total Utility** |
| 2008 | $1,703,979 | $934,294 | $1,343,923 | $0 | $178,539 | $352,315 | $3,982,196 | $4,513,050 |
| 2009 | $1,812,404 | $918,912 | $1,482,832 | $0 | $194,998 | $372,809 | $4,214,148 | $4,781,955 |
| 2010 | $1,373,627 | $1,108,485 | $1,274,730 | $0 | $218,302 | $320,782 | $3,756,842 | $4,295,926 |
| 2011 | $1,237,855 | $1,110,759 | $1,352,199 | $0 | $213,485 | $333,658 | $3,700,813 | $4,247,956 |
| 2012 | $1,322,953 | $1,162,791 | $1,064,846 | $0 | $297,666 | $503,442 | $3,550,590 | $4,351,698 |
| **Average** | **$1,490,164** | **$1,047,048** | **$1,303,706** | **$0** | **$220,598** | **$376,601** | **$3,840,918** | **$4,438,117** |

(1) Includes 2008 and 2009 Jail II electricity data.

The Justice Center Complex spent $3,550,590 on energy and $4,351,698 on all utilities in 2012. The annual energy and utility costs for the Justice Center have remained relatively constant over the last 5 years.

## 1.3. Rates

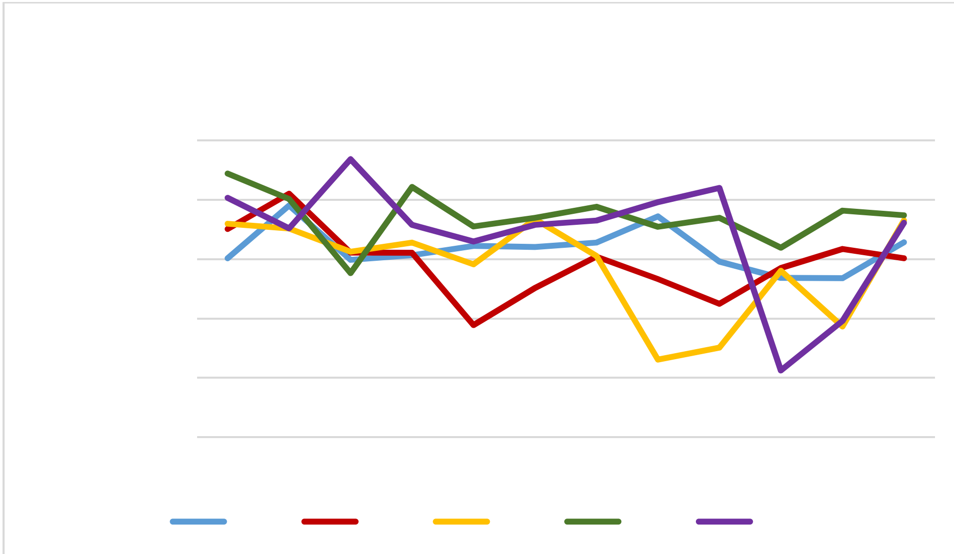
| JUSTICE CENTER COMPLEX ANNUAL UTILITY RATES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Electricity $/kWh 91)** | **Steam $/MLB** | **Chilled Water $/Ton-Hour** | **Water $/Mcf** | **Sewer $/Mcf** | **Electricity $/mmbtu** | **Total Energy $/gsf** | **Total Utility $/gsf** |
| 2008 | $0.083 | $13.901 | $0.483 | $22.857 | $45.105 | $24.25 | $3.451 | $3.911 |
| 2009 | $0.081 | $14.319 | $0.567 | $24.822 | $47.455 | $23.85 | $3.652 | $4.144 |
| 2010 | $0.080 | $16.205 | $0.424 | $28.403 | $41.736 | $23.48 | $3.256 | $3.723 |
| 2011 | $0.070 | $17.315 | $0.451 | $25.965 | $40.581 | $20.61 | $3.207 | $3.681 |
| 2012 | $0.070 | $22.61 | $0.36 | $33.166 | $56.094 | $20.41 | $3.077 | $3.771 |
| **Average** | **$0.077** | **$16.87** | **$0.46** | **$27.04** | **$46.19** | **$22.521** | **$3.329** | **$3.846** |

(1) Includes 2008 and 2009 Jail II electricity data.

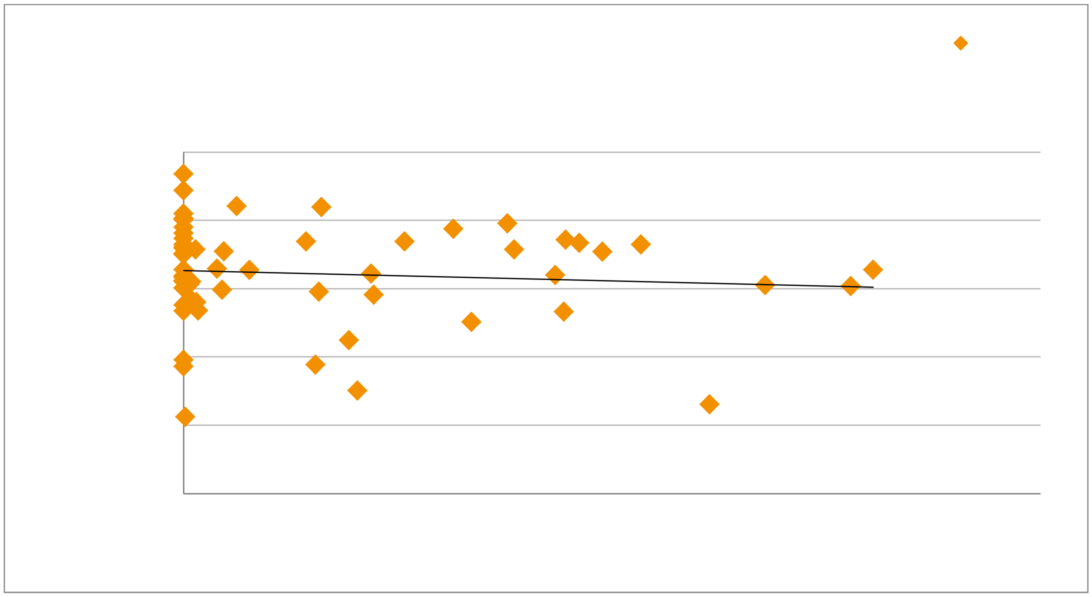
Overall the utility rates have stayed relatively constant with sewer and water increasing and electricity decreasing.

## 1.4. Electricity Use

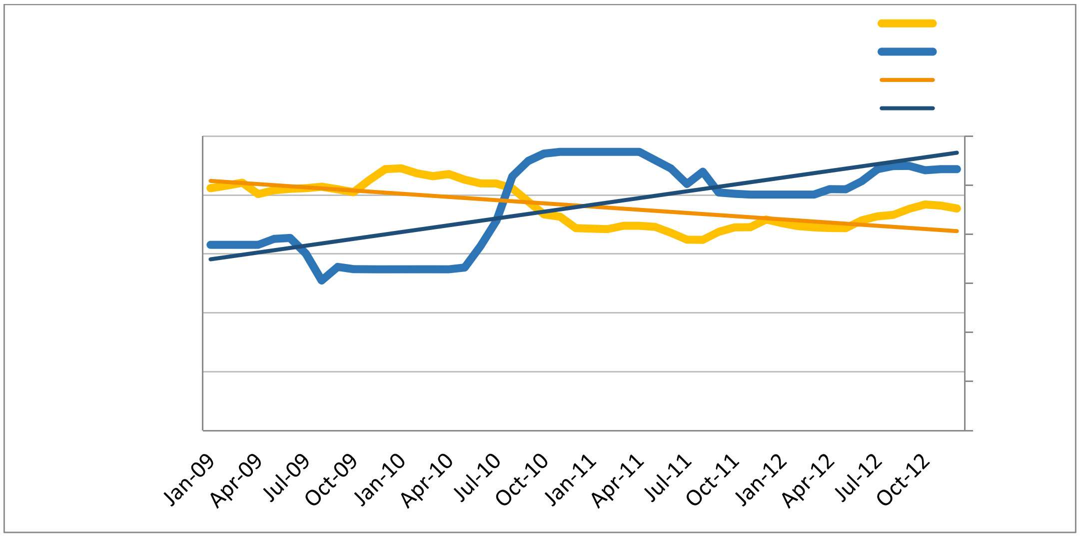
The Illuminating Company provides electricity transmission & distribution and First Energy Solutions provides generation. The graph below shows the monthly electricity consumption of the Justice Center beginning in January 2008 and ending in December 2012. Electricity consumption is fairly erratic from month-to-month and year-to-year with no discernible pattern.



Typically, energy consumption is driven largely by weather patterns. The extent to which this is true for a facility can provide an indication as to the size of the opportunity and the manner in which to make energy saving improvements. One way to analyze the impact of weather on a facility's energy consumption is to correlate to an index called "degree days." These indices are calculated using a base temperature of 65 degrees Fahrenheit. Heating degree days (HDD) reflect the demand for energy needed to heat a facility. If the average outside air temperature is 31 degrees, the HDD index for that day is the difference between 65 and 31 degrees, or 34. Cooling degree days (CDD) are the opposite and reflect the demand to cool a facility. Typically, electricity is more affected by the cooling needs of a facility; the cooling degree day index can be used to analyze changes in electricity consumption. However at the Justice Center Complex electricity is not used for either building heat or cooling, therefore cooling degree days (CDD) should have minimal influence on electricity consumption. The chart below shows a regression analysis of electricity use and CDD since January 2008. The $R^2$ value indicates the strength of the correlation between electricity use and CDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.0084, indicating a very weak correlation between electricity use and CDD.

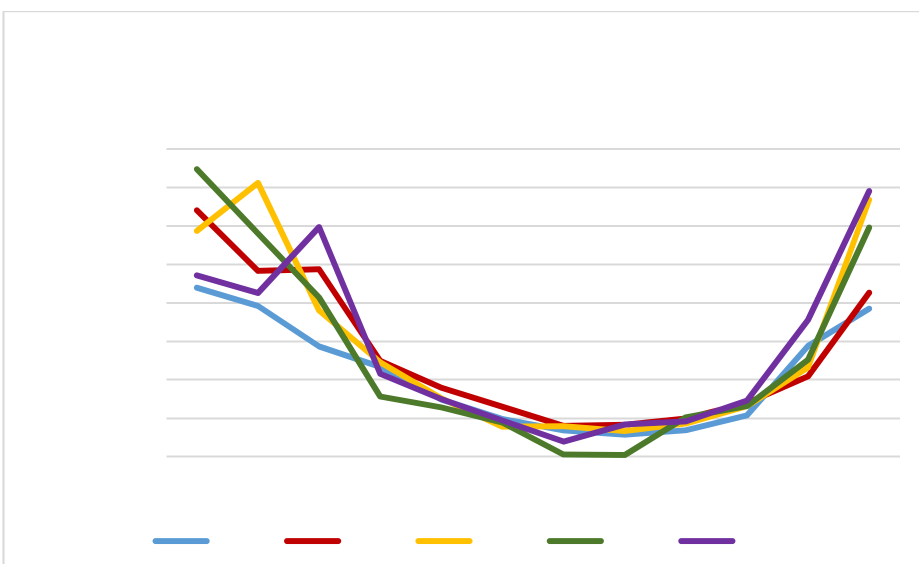


The graph below shows the 12-month rolling sum of electricity consumption compared to a 12-month rolling sum of cooling degree days. Each month's value along the orange line on the graph below signifies the 12-month total electricity consumption for the 12 previous months. Each month's value along the blue line on the graph below signifies the 12-month total cooling degree days for the 12 previous months. This trend was graphed for 2009 through 2012 to determine the relationship between weather patterns and electricity consumption. Since 2006, electricity consumption has decreased; this is indicated by the negative slope of the trend line of electricity consumption. The trend line of cooling degree days has increased slightly. The decrease in electricity consumption therefore is not due to weather patterns, but normally would be indicative of a slight improvement in equipment efficiencies or a change in building operation. However, in this case the decrease in consumption is due at least in part to the removal of Jail II's consumption from years 2010-2012.

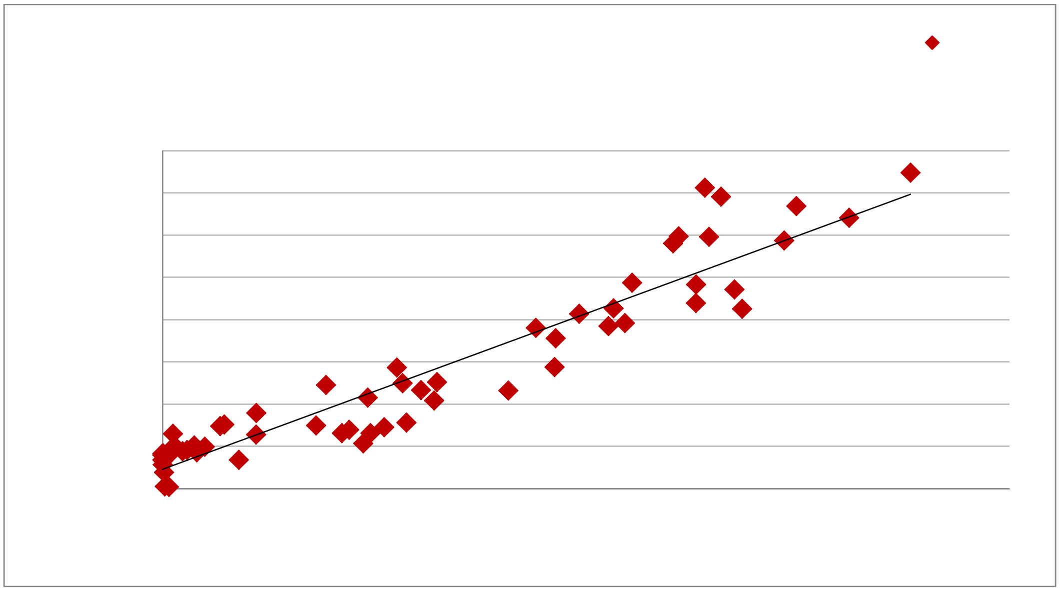



### 1.5. District Steam Use

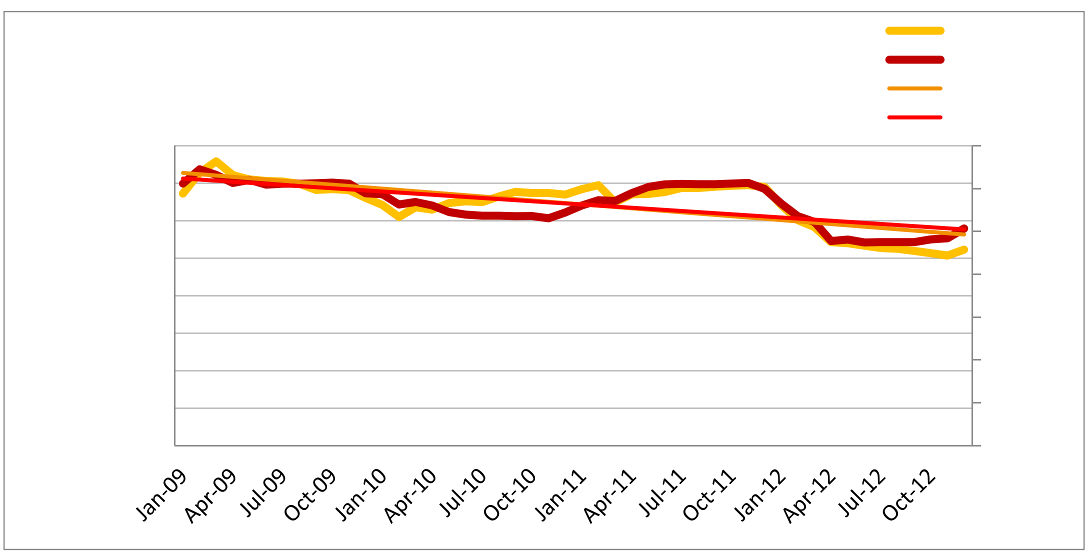
Cleveland Thermal provides district steam; the County's current contract with Cleveland Thermal expires on December 31, 2013. District steam is billed almost entirely based on monthly consumption without a capacity charge or peak demand component. Steam condensate is not returned to Cleveland Thermal. The following graph shows the monthly steam consumption starting in October 2008 and ending in December 2012. Steam consumption typically peaks around 15,000 Mlbs in the coldest month of the year and drops to below 1,600 Mlbs during the summer months. This is indicative of a low domestic hot water steam demand and good HVAC control practices to minimize use of steam in the summer for reheat. Consumption during the summer of 2009 was extremely low which may have been due to a metering error or abnormally low consumption.



District steam is used almost entirely for building heat; therefore, steam consumption should trend very closely with heating degree days. The chart below shows a regression analysis of district steam use and HDD since January 2008. The $R^2$ value indicates the strength of the correlation between steam use and HDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.9027, indicating a strong correlation between steam use and HDD.

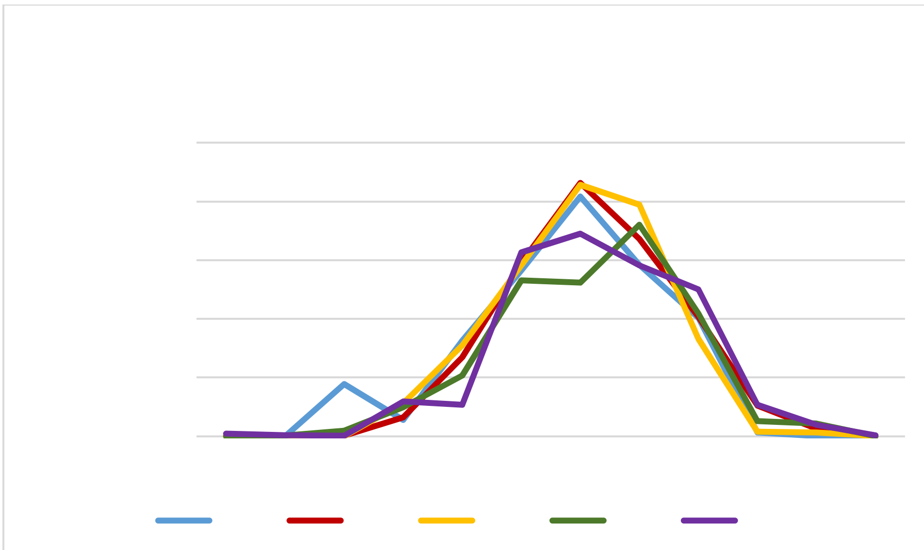


Since 2009, steam consumption has decreased in response to a corresponding decrease in heating degree days.  This is indicated by the negative slope of both the steam use trend line and the heating degree trend line.

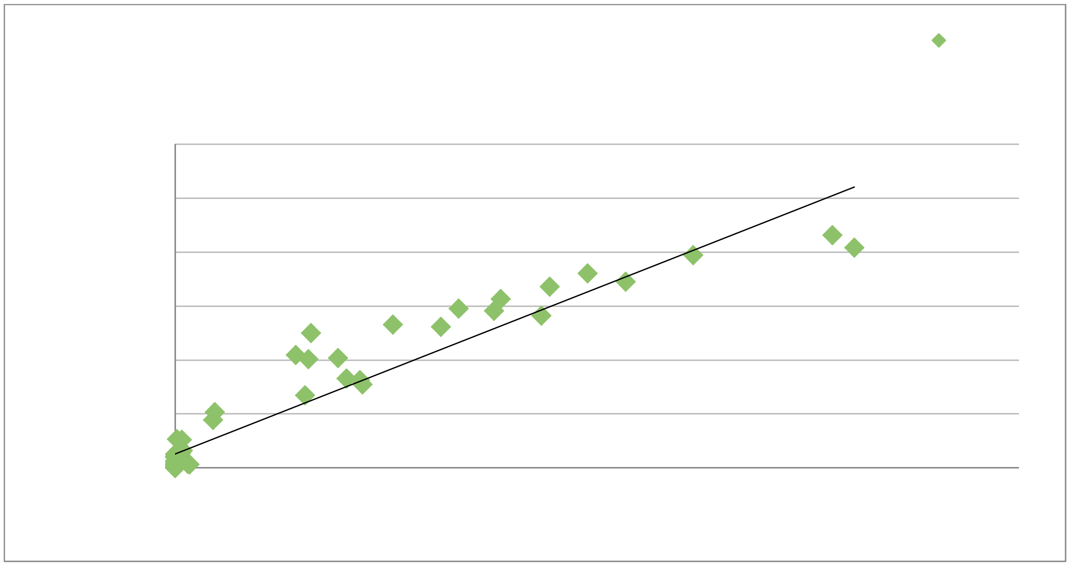


### 1.6. District Chilled Water Use

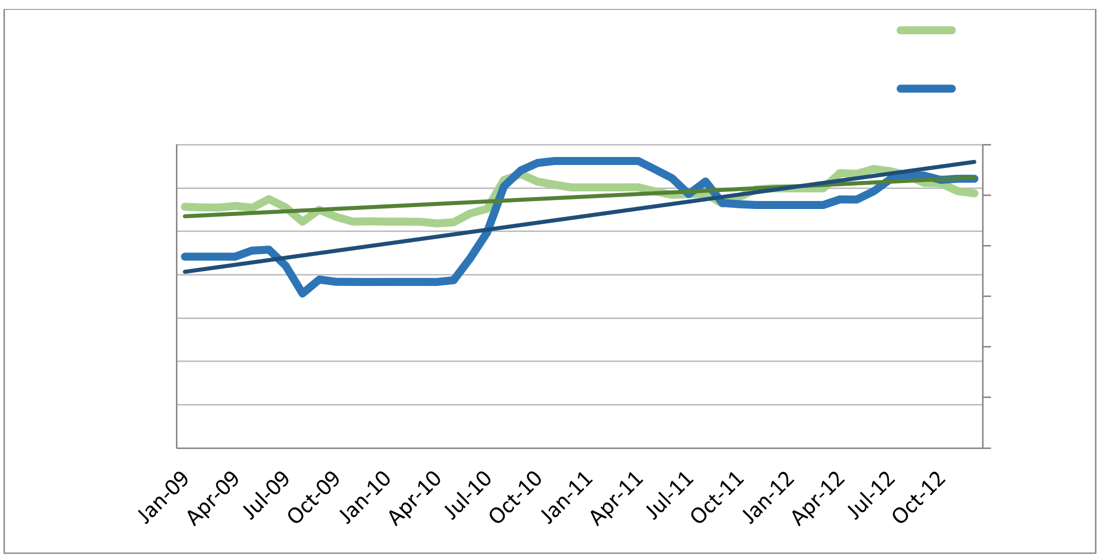
Cleveland Thermal provides district chilled water; the County's current contract with Cleveland Thermal expires on December 31, 2013. District chilled water is billed almost entirely based on monthly consumption with a relatively small capacity charge and a rarely billed, low return water temperature penalty. The graph below shows monthly chilled water consumption starting in October 2008 and ending in December 2012. Consumption has remained relatively consistent.



Chilled water is used solely for building cooling; therefore, chilled water consumption should trend very closely with cooling degree days. The chart below shows a regression analysis of district chilled water use and CDD since October 2008. The $R^2$ value indicates the strength of the correlation between chilled water use and CDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.9213, indicating a strong correlation between chilled water use and CDD.



Since 2009, both chilled water consumption and cooling degree days have increased. However, cooling degree days have increased at a higher rate. This is indicated by the positive slope of the trend line of chilled water consumption and the marginally positive slope of the trend line of cooling degree days. The increase in chilled water consumption, appears to be due to change in use of the building or increase in system efficiency.



# 2. Building: Jail II

A separate utility analysis was performed for Jail II, as it has independent meters for its services. Cost consumption and rates were compiled for electricity, chilled water, steam, water, and sewer for the 5 year period between 2008 and 2012. Jail II spent $1,271,703 on utilities in 2012.

## 2.1. Consumption

| JAIL II ANNUAL UTILITY CONSUMPTION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Electricity kWh (1) | Steam MLB | CHW Ton-Hour | CDD | HDD | Total Energy kbtu | Gross Floor Area gsf (2) | Energy Use Intensity kbtu/gsf | Water / Sewer mcf |
| 2008 | | 17,004 | 838,846 | 757 | 6,116 | 30,368,928 | 284,500 | | 3,718 |
| 2009 | | 17,944 | 755,651 | 657 | 5,864 | 30,492,948 | 284,500 | | 4,619 |
| 2010 | 1,319,620 | 16,510 | 928,638 | 1,136 | 5,604 | 35,359,139 | 284,500 | 124 | 5,721 |
| 2011 | 1,331,520 | 15,206 | 830,426 | 962 | 5,644 | 32,664,222 | 284,500 | 115 | 5,381 |
| 2012 | 1,292,560 | 14,410 | 725,805 | 1,066 | 5,057 | 30,325,415 | 284,500 | 107 | 6,399 |
| **Average** | **1,314,567** | **16,215** | **815,873** | **915** | **5,657** | **31,842,130** | **284,500** | **112** | **5,168** |

(1) Jail II electricity data for 2008 or 2009.is included in JCC.

(2) Jail II gross floor area is estimated.

Jail II has reduced its EUI by 14% from 2010 to 2012. This corresponds to the decreased electric, steam, and chilled water consumption over the same span. The EUI value of 107 in 2012 is below the average EUI for an office (116) or dormitory (110). Therefore this building appears to have an efficient design and operation based on this utility data. However, some of the building's electricity consumption is likely not included in this utility data, making the building appear more efficient than it really is. Refer to Section 2.4 for more information.

## 2.2. Cost

| JAIL II COMPLEX ANNUAL UTILITY COST | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Electricity (1) | Steam | Chilled Water | Natural Gas | Water | Sewer | Total Energy | Total Utility |
| 2008 | | $274,473 | $333,017 | $0 | $100,415 | $197,990 | $607,490 | $905,895 |
| 2009 | | $272,591 | $372,020 | $0 | $124,193 | $160,768 | $644,611 | $929,572 |
| 2010 | $177,789 | $310,480 | $244,038 | $0 | $171,444 | $263,022 | $732,307 | $1,166,773 |
| 2011 | $181,598 | $282,163 | $299,322 | $0 | $164,269 | $330,932 | $763,083 | $1,258,284 |
| 2012 | $171,334 | $273,950 | $238,293 | $0 | $204,795 | $383,331 | $683,577 | $1,271,703 |
| **Average** | **$176,907** | **$282,731** | **$297,338** | **$0** | **$153,023** | **$267,209** | **$756,976** | **$1,177,208** |

(1) Jail II electricity data for 2008 or 2009.is included in JCC.

Jail II spent $683,577 on energy and $1,271,703 on all utilities in 2012. The annual energy cost has fluctuated while overall utility costs have steadily increased over the last 5 years. This is primarily in response to increasing water and sewer costs.

## 2.3. Rates

| JAIL II ANNUAL UTILITY RATES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Electricity $/kWh (1) | Steam $/MLB | Chilled Water $/Ton-Hour | Water $/Mcf | Sewer $/Mcf | Electricity $/mmbtu | Total Energy $/gsf | Total Utility $/gsf |
| 2008 | | $16.142 | $0.397 | $27.008 | $53.252 | $0.00 | | |
| 2009 | | $15.191 | $0.492 | $26.887 | $34.806 | $0.00 | | |
| 2010 | $0.135 | $18.806 | $0.263 | $29.967 | $45.975 | $39.48 | $2.574 | $4.101 |
| 2011 | $0.136 | $18.556 | $0.360 | $30.528 | $61.500 | $39.96 | $2.682 | $4.423 |
| 2012 | $0.133 | $19.01 | $0.33 | $32.004 | $59.905 | $38.84 | $2.403 | $4.470 |
| **Average** | **$0.135** | **$17.54** | **$0.37** | **$29.28** | **$51.09** | **$23.655** | **$2.661** | **$4.138** |

(1) Jail II electricity data for 2008 or 2009 is included in JCC.

The overall energy rate decreased in 2012 as compared to previous years, while total utility rates have generally increased over the last 5 years due to significant sewer and water rate increases. The electric rate is significantly higher for Jail II than the Justice Center Complex.

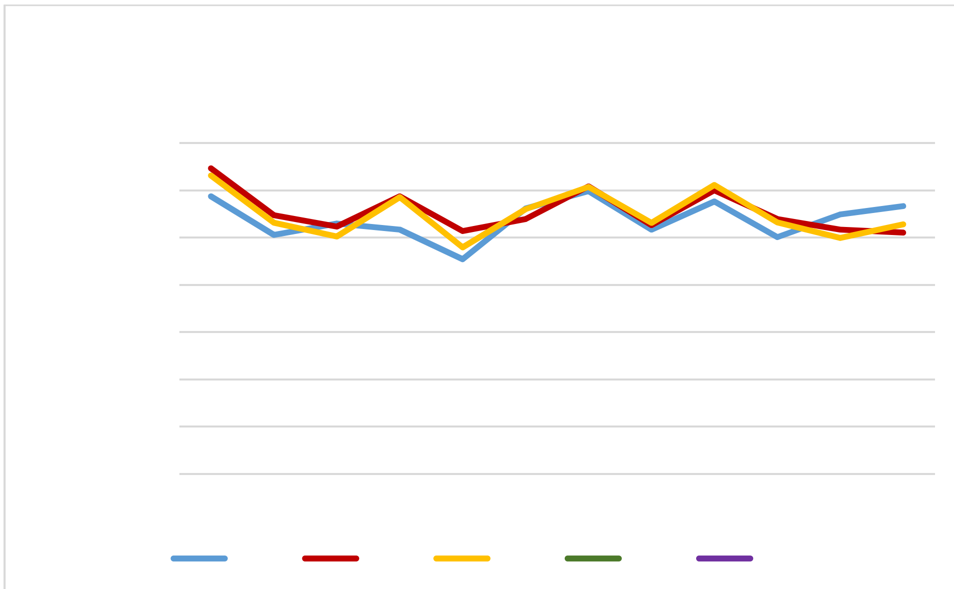
## 2.4. Electricity Use

The Illuminating Company provides electricity transmission and distribution; First Energy Solutions provides generation. The graph below shows the monthly electricity consumption of Jail II beginning in January 2010 and ending in December 2012. Data for years 2008 and 2009 was omitted because it was unavailable. Electricity consumption is fairly consistent from month-to-month and year–to-year with no discernible pattern.

Electricity data was compiled using monthly readings from meters #64432321 and #64419216 installed in 2010 by Standard Energy Services to sub-meter Jail II. Originally, the electricity data was recorded incorrectly and data from meter #64432321 was missing. However, the corrected electricity consumption of Jail II with both meters included still seems low. The building is used 24 hours per day, 7 days per week and is fully occupied. The electricity needed to power the building's lights and HVAC fans for 8,760 hours per year is more than twice the amount that is currently being used.

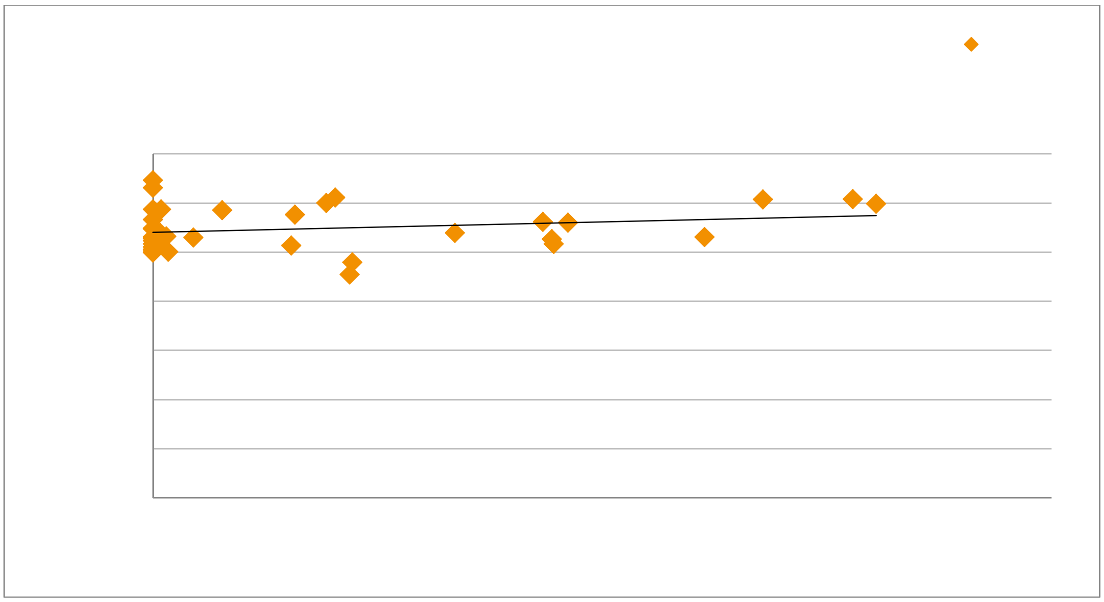
The building computer simulation of Jail II performed as part of the Lifecycle Cost Analysis was created using the building's design and operational parameters. This simulation indicated that the building should be using approximately 3,500,000 kWh per year of electricity, which is significantly more than the average 1,314,567 kWh. Coincidentally, when Jail II's electricity usage was removed from the Justice Center Complex's main meter in 2010, the complex's electric consumption decreased by an average 3,512,137 kWh.

Therefore, it is possible that not all of the electricity being used by Jail II is being metered or recorded as being used by Jail II. This should be investigated further to verify how much electricity the building is actually using.

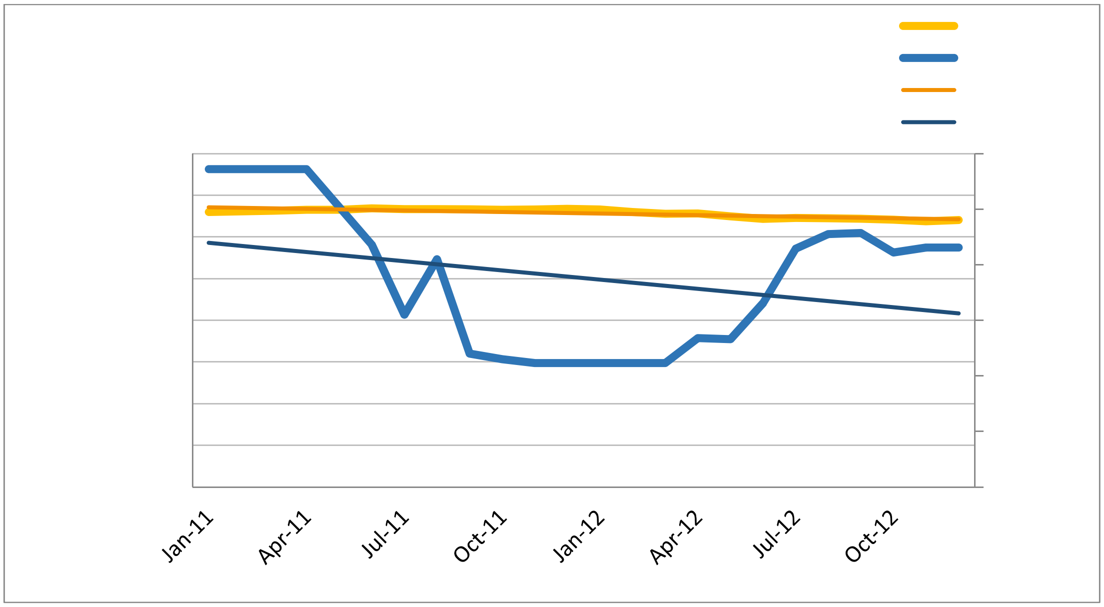


During our review of Jail II's most recent utility bills, we also noticed that the 3/19/13 to 4/18/13 reading of meter #64419216 was unusually high, about ten times the average reading of the other months. It is unlikely that this electricity spike was caused by weather or occupancy changes since the difference was so significant. Since the meter readings are manually recorded, we believe that this is a recording error and an extra "0" was accidentally added onto the end of the actual meter reading, making it 361,280 kWh instead of 36,128 kWh. Cuyahoga County should follow up with Standard Energy Systems about the potential error and verify that the correct amount was paid for electricity that month instead of $41,103 extra.

Typically, energy consumption is driven largely by weather patterns. The extent to which this is true for a facility can provide an indication as to the size of the opportunity and the manner in which to make energy saving improvements. One way to analyze the impact of weather on a facility's energy consumption is to correlate to an index called "degree days." These indices are calculated using a base temperature of 65 degrees Fahrenheit. Heating degree days (HDD) reflect the demand for energy needed to heat a facility. If the average outside air temperature is 31 degrees, the HDD index for that day is the difference between 65 and 31 degrees, or 34. Cooling degree days (CDD) are the opposite and reflect the demand to cool a facility. Typically, electricity is more affected by the cooling needs of a facility; the cooling degree day index can be used to analyze changes in electricity consumption. However at the Justice Center Complex electricity is not used for either building heat of cooling, therefore cooling degree days (CDD) should have minimal influence on electricity consumption. The chart below shows a regression analysis of electricity use and CDD since January 2008. The $R^2$ value indicates the strength of the correlation between electricity use and CDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.0563, indicating a very weak correlation between electricity use and CDD.

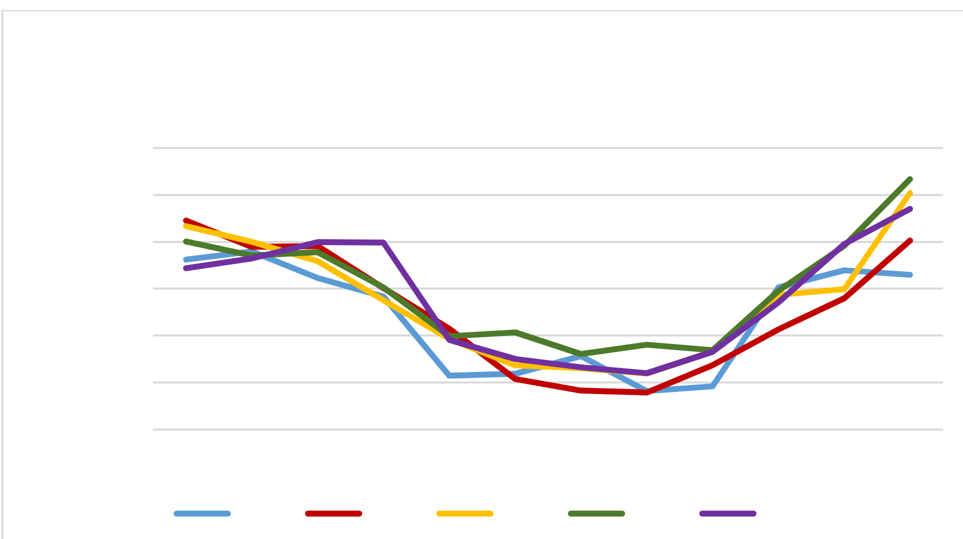


The graph below shows the 12-month rolling sum of electricity consumption compared to a 12-month rolling sum of cooling degree days. Each month's value along the orange line on the graph below signifies the 12-month total electricity consumption for the 12 previous months. Each month's value along the blue line on the graph below signifies the 12-month total cooling degree days for the 12 previous months. This trend was graphed for 2011 through 2012 to determine the relationship between weather patterns and electricity consumption. Since 2011, electricity consumption has slightly decreased; this is indicated by the negative slope of the trend line of electricity consumption. The trend line of cooling degree days has decreased while electricity consumption has remained relatively flat further confirming that weather has very little impact on electricity consumption.

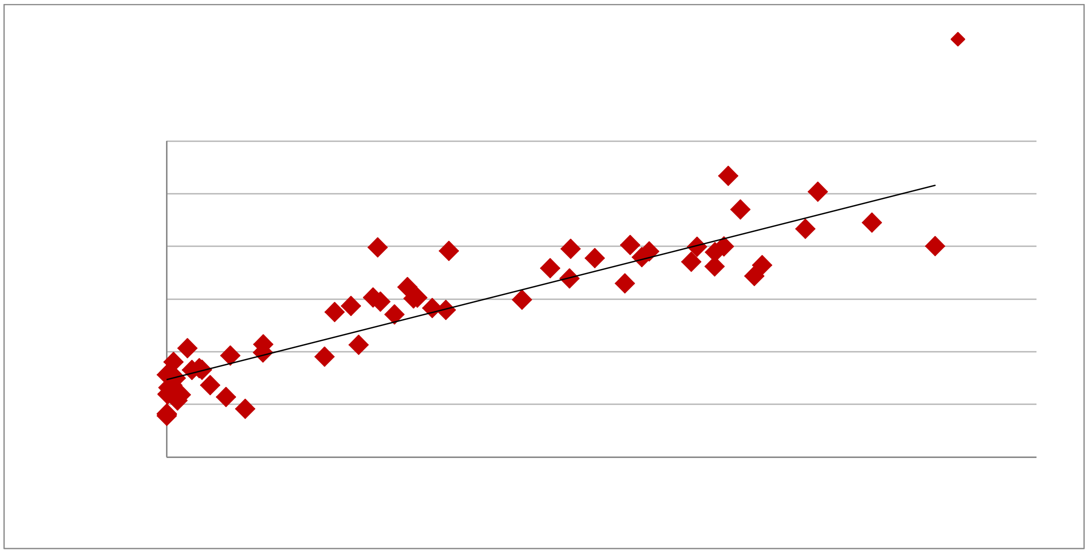



## 2.5. District Steam Use

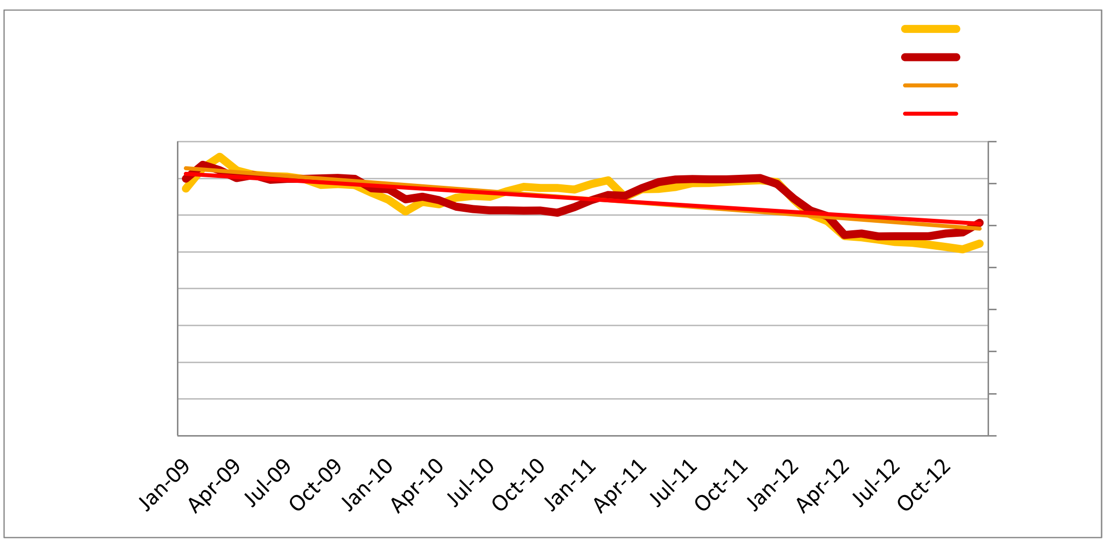
Cleveland Thermal provides district steam; the County's current contract with Cleveland Thermal expires on December 31, 2013. District steam is billed almost entirely based on monthly consumption without a capacity charge or peak demand component. Steam condensate is not returned to Cleveland Thermal. The following graph shows the monthly steam consumption starting in October 2008 and ending in December 2012. Steam consumption typically peaks around 2,500 Mlbs in the coldest month of the year and drops to below 500 Mlbs during the summer months. This is indicative of a low domestic hot water steam demand and good HVAC control practices to minimize use of steam in the summer for reheat.



District steam is used almost entirely for building heat; therefore, steam consumption should trend very closely with heating degree days. The chart below shows a regression analysis of district steam use and HDD since January 2008. The $R^2$ value indicates the strength of the correlation between steam use and HDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.8354, indicating a fairly strong correlation between steam use and HDD.

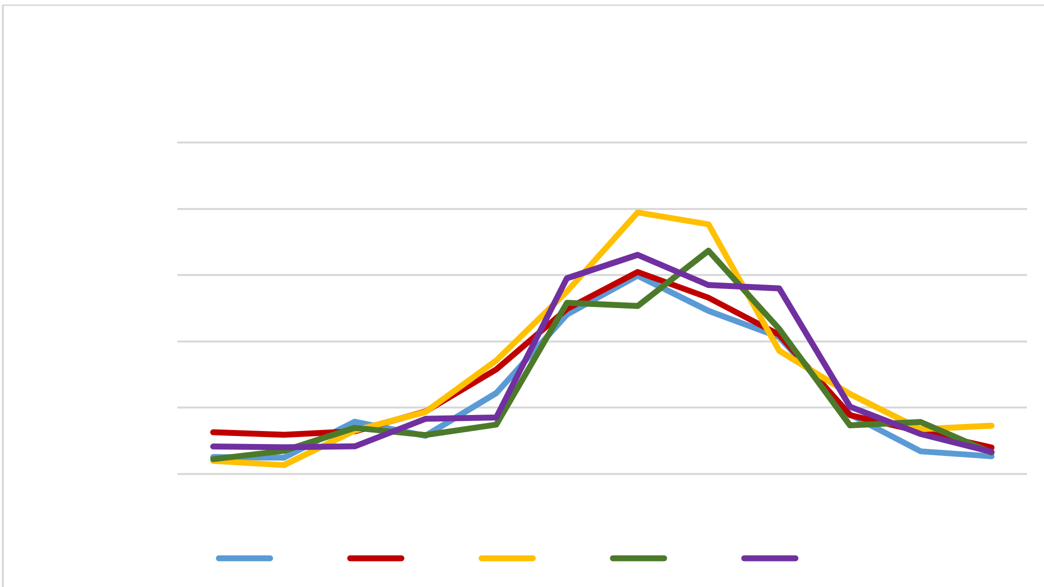


Since 2009, steam consumption has decreased in response to a corresponding decrease in heating degree days. This is indicated by the negative slope of both the steam use trend line and the heating degree trend line.

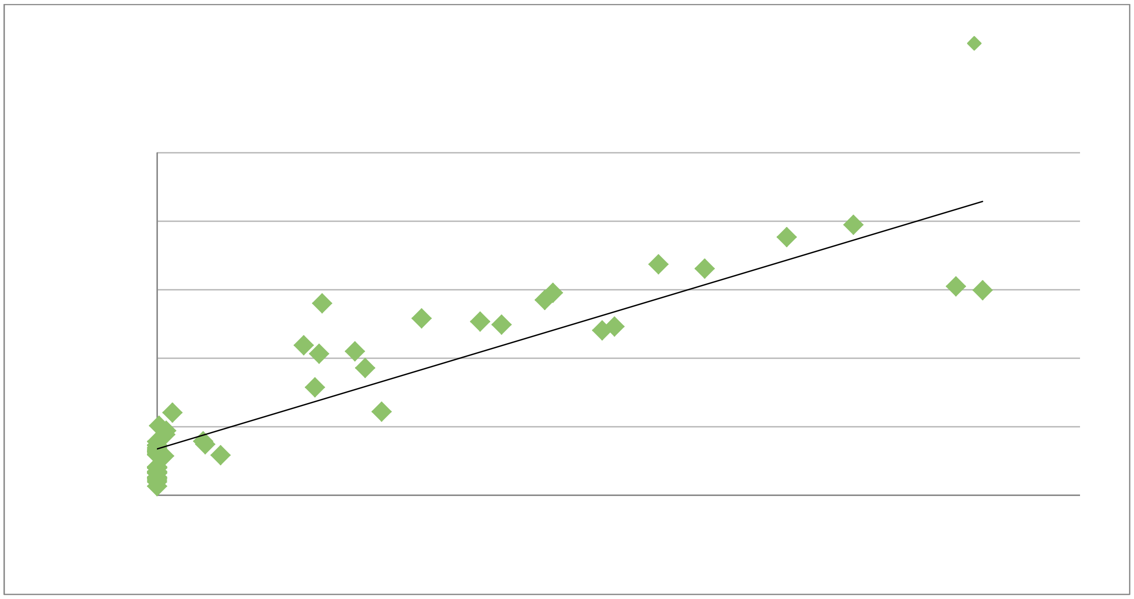


### 2.6. District Chilled Water Use

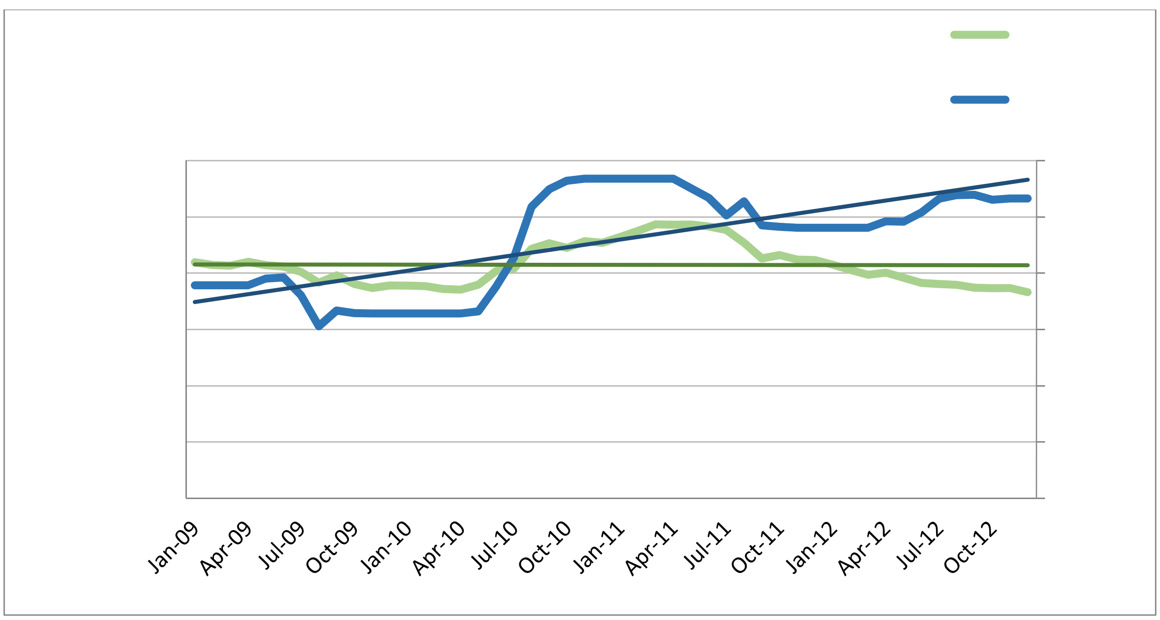
Cleveland Thermal provides district chilled water; the County's current contract with Cleveland Thermal expires on December 31, 2013. District chilled water is billed almost entirely based on monthly consumption with a relatively small capacity charge and rarely billed low return water temperature penalty. The graph below shows the monthly chilled water consumption starting in October 2008 and ending in December 2012. Consumption has remained relatively consistent.



Chilled water is used solely for building cooling; therefore, chilled water consumption should trend very closely with cooling degree days. The chart below shows a regression analysis of district chilled water use and CDD since October 2008. The R2 value indicates the strength of the correlation between chilled water use and CDD. The closer the R2 value is to 1, the stronger the correlation. The R2 value is 0.8358, indicating a fairly strong correlation between chilled water use and CDD.



Since 2009, chilled water consumption has decreased while cooling degree days have increased at a rapid rate. This is indicated by the positive slope of the trend line of chilled water consumption and the marginally positive slope of the trend line of cooling degree days. The decrease in chilled water consumption, therefore, appears to be due to change in use of the building or increase in system efficiency.



# 3. Building: Police Building

A separate utility analysis was performed for the Police Building given the independent metering of its services. Utility consumption was compiled for electricity, chilled water, steam and gas usage for the 3 year period 2010 thru 2012. Utility companies include:

- Cleveland Thermal provides steam and chilled water.
- CPP (Cleveland Public Power) is the provider for electricity.
- Dominion is the provider for gas.

*Note: The floor area of the Parking Garage was omitted from the EUI analysis. Utility cost data was not available.*

## 3.1. Consumption

Energy Use Index (EUI) is a measure of the intensity of a facility's energy use in terms of total energy consumption from all sources per square foot per year (kBtu/ft2). It is often used to compare the energy consumption of facilities that have similar functions and is a good indicator of the energy efficiency of a facility. The U.S. Department of Energy (DOE) has developed a series of benchmark models to help establish a EUI representation of different building types in different geographic areas. Although a "jail" category does not exist in DOE benchmark models, the table below identifies various building type EUI's and cost/gsf data for reference. Benchmark data was taken from the Energy Information Administration's (EIA) Commercial Building Energy Consumption Survey (CBECS) database, specifically for the building types shown below in the 5A climate region.

| CBECS Benchmark Data in Climate Zone 5A | | |
|---|---|---|
| **Building Type** | **Average EUI (kBtu/gsf)** | **Average Energy Cost/gsf** |
| **College*** | 132 | $1.81 |
| **Hospital*** | 272 | $2.72 |
| **Office*** | 116 | $1.88 |
| **Medical Office*** | 101 | $1.61 |
| **Warehouse*** | 77 | $1.02 |
| **Dormitory*** | 110 | $1.27 |

****Source:* http://buildingsdatabook.eren.doe.gov/CBECS.aspx**

| POLICE ANNUAL UTILITY CONSUMPTION | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **Electricity kWh** | **Steam MLB** | **CHW Ton-Hour** | **Natural Gas MCF** | **CDD** | **HDD** | **Total Energy kbtu** | **Gross Floor Area gsf (2)** | **Energy Use Intensity kbtu/gsf** | **Water / Sewer mcf (1)** |
| 2010 | 5,999,376 | 9,400 | 1,061,522 | 7 | 1,136 | 5,604 | 44,438,352 | 270,000 | 165 | 2,887 |
| 2011 | 5,834,665 | 9,076 | 1,339,178 | 10 | 962 | 5,644 | 46,825,020 | 270,000 | 173 | 2,087 |
| 2012 | 5,212,345 | 7,471 | 969,024 | 13 | 1,066 | 5,057 | 38,346,096 | 270,000 | 142 | |
| **Average** | **5,682,129** | **8,649** | **1,123,241** | **10** | **1,054** | **5,435** | **43,203,156** | **270,000** | **160** | **2,487** |

(1) Full water/sewer data was not available for 2012.

The Police EUI, based on electricity, steam, chilled water, and natural gas consumption, increased by 5% from 2010 to 2011 and then decreased by 18% in 2012. The EUI value of 142 in 2012 is above the average EUI for an office building (116). However, a Police building will use more energy than a typical office building since it is occupied for longer hours; thus, the building's EUI is probably close to average.

### 3.2. Cost

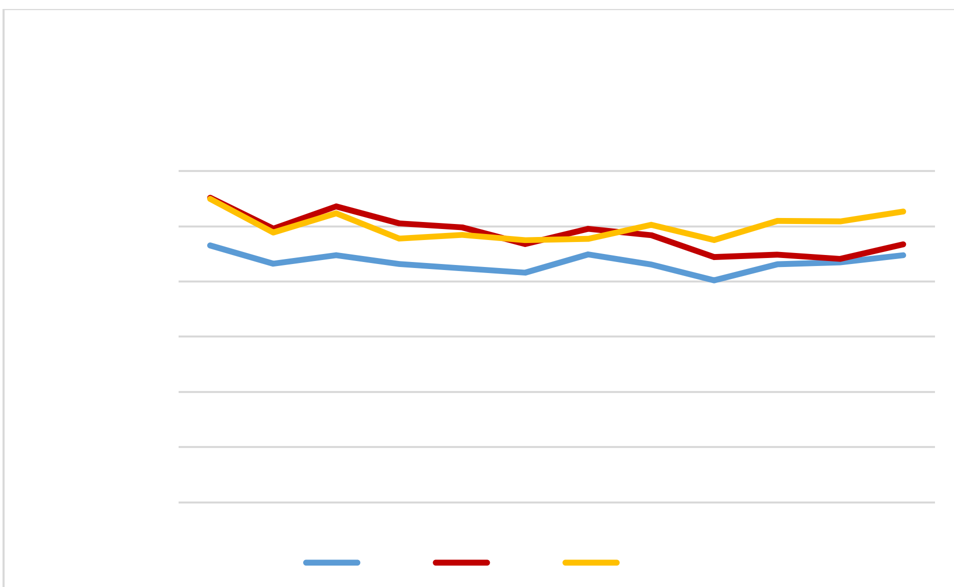
No cost data was available for the Police building at the time of the utility analysis.

### 3.3. Rates

No cost data was available for the Police building in order to determine utility rates.

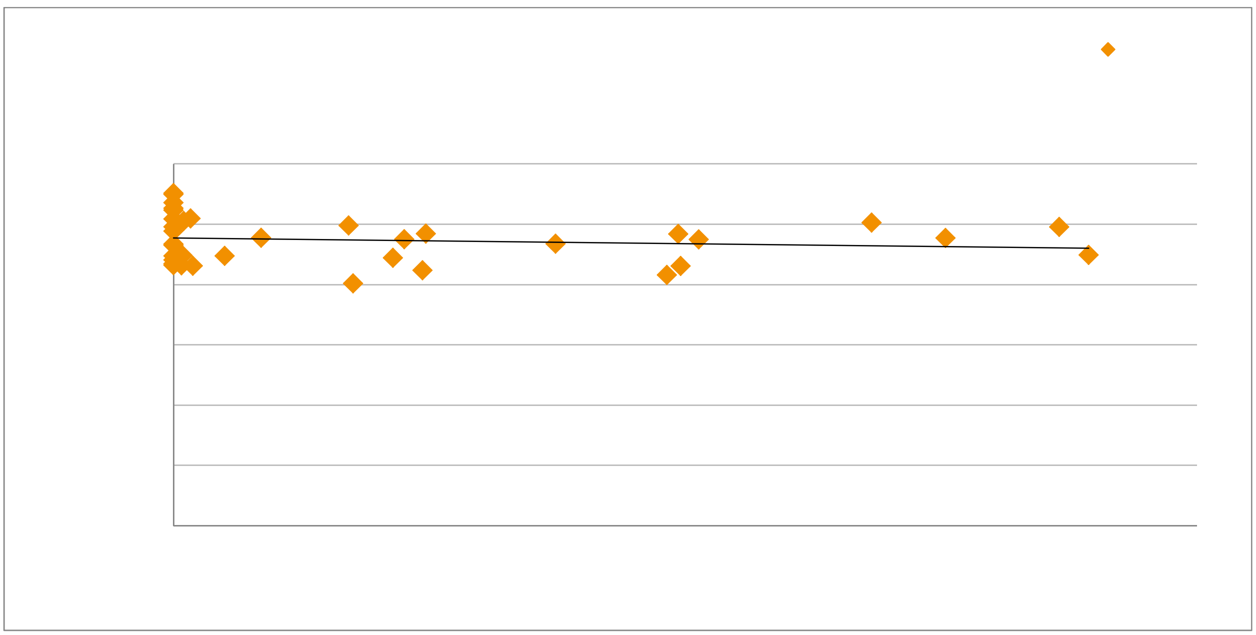
### 3.4. Electricity Use

The graph below shows the monthly electricity consumption of the Police building beginning in January 2010 and ending in December 2012. Data for years 2008 and 2009 was not available. Electricity consumption is fairly consistent from month-to-month and year-to-year with no discernible pattern.

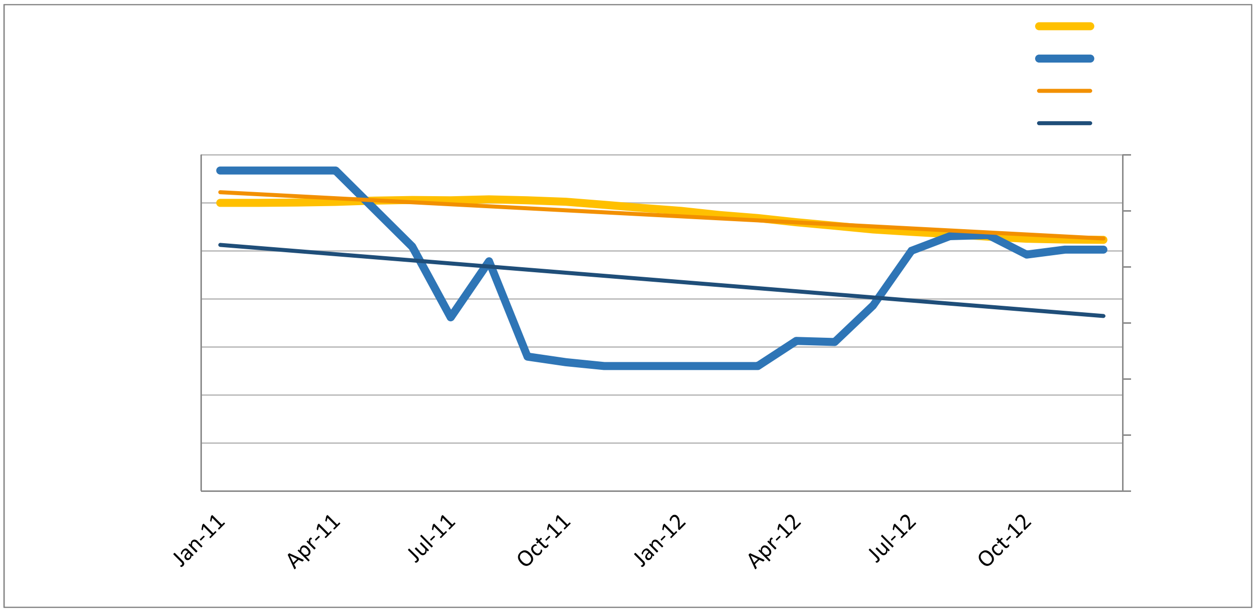


Typically, energy consumption is driven largely by weather patterns. The extent to which this is true for a facility can provide an indication as to the size of the opportunity and the manner in which to make energy saving improvements. One way to analyze the impact of weather on a facility's energy consumption is to correlate to an index called "degree days."

These indices are calculated using a base temperature of 65 degrees Fahrenheit. Heating degree days (HDD) reflect the demand for energy needed to heat a facility. If the average outside air temperature is 31 degrees, the HDD index for that day is the difference between 65 and 31 degrees, or 34. Cooling degree days (CDD) are the opposite and reflect the demand to cool a facility. Typically, electricity is more affected by the cooling needs of a facility; the cooling degree day index can be used to analyze changes in electricity consumption. However at the Police building electricity is not used for either building heat or cooling, therefore cooling degree days (CDD) should have minimal influence on electricity consumption. The chart below shows a regression analysis of electricity use and CDD since January 2010. The $R^2$ value indicates the strength of the correlation between electricity use and CDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.0186, indicating a very weak correlation between electricity use and CDD.

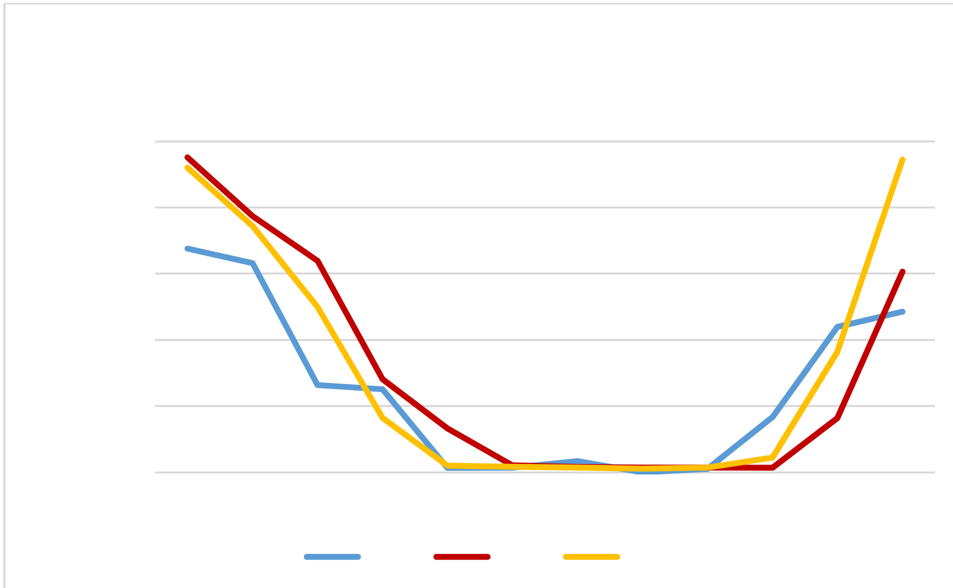


The graph below shows the 12-month rolling sum of electricity consumption compared to a 12-month rolling sum of cooling degree days. The analysis starts in January 2011 to capture full 12-months of data. Each month's value along the orange line on the graph below signifies the 12-month total electricity consumption for the 12 previous months. Each month's value along the blue line on the graph below signifies the 12-month total cooling degree days for the 12 previous months. This trend was graphed for 2011 through 2012 to determine the relationship between weather patterns and electricity consumption. Since 2010, electricity consumption has decreased; this is indicated by the negative slope of the trend line of electricity consumption. The trend line of cooling degree days has decreased at a similar rate, indicating that the decrease in energy is more likely due to less cooling demand than improvements in the building's efficiency.

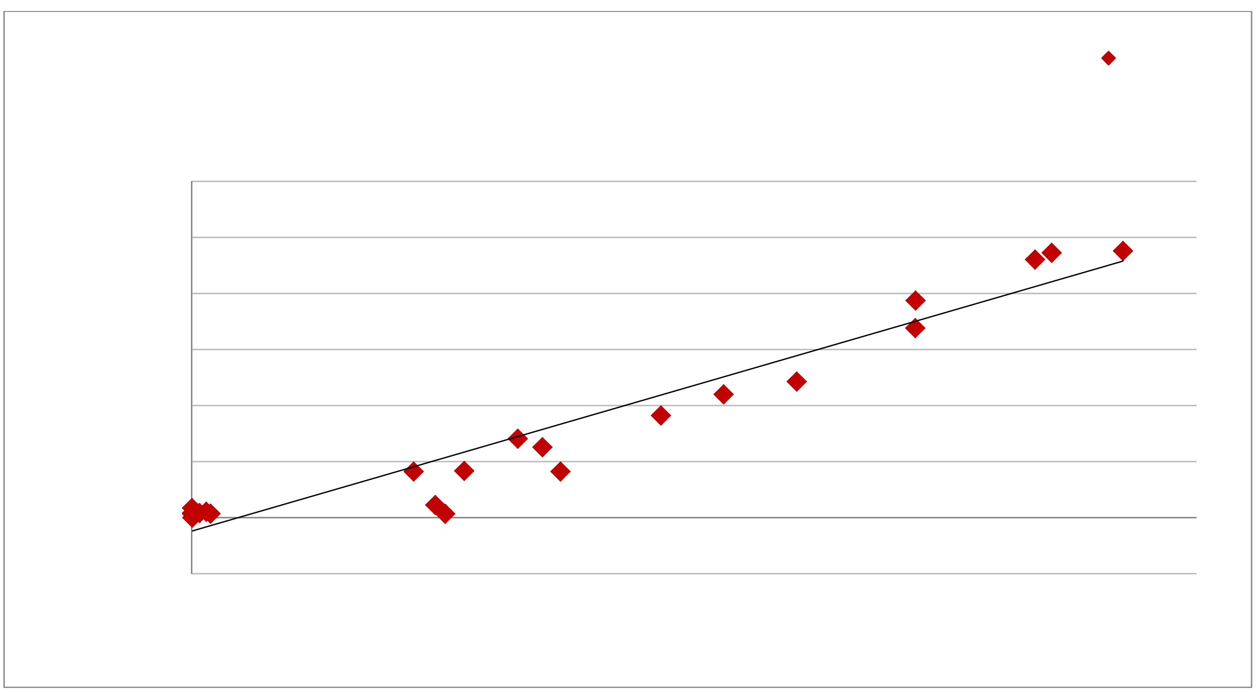



### 3.5. District Steam Use

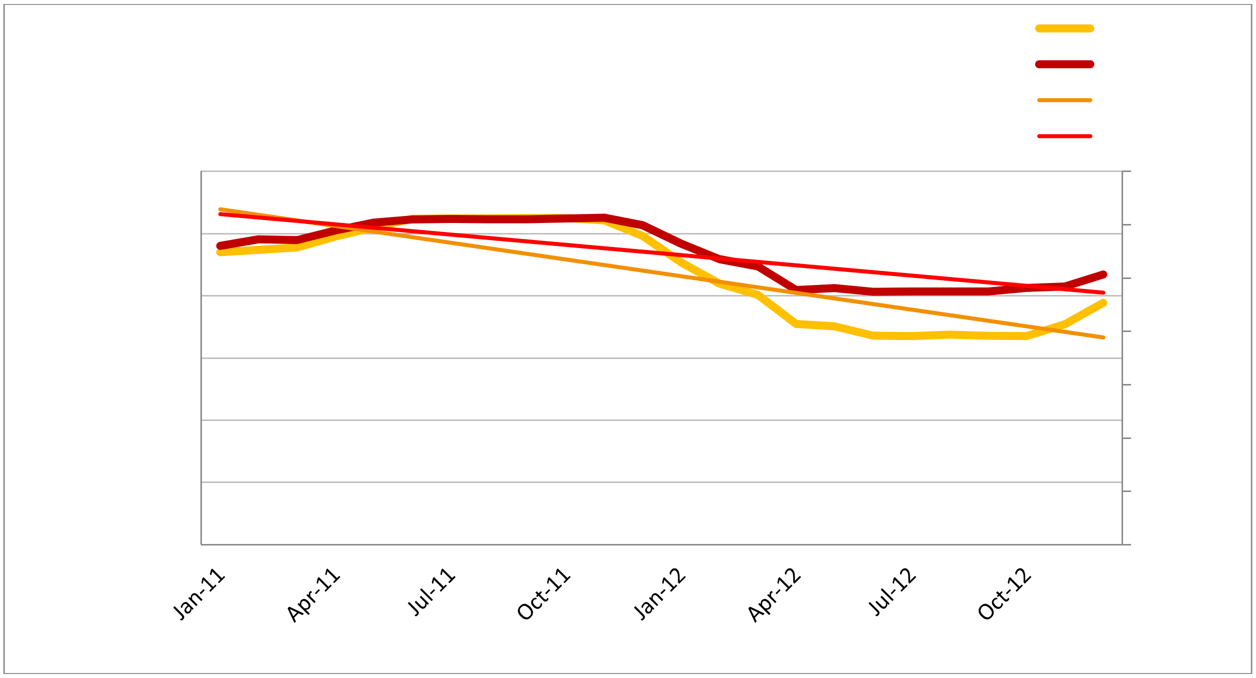
District steam is billed almost entirely based on monthly consumption without a capacity charge or peak demand component. Steam condensate is not returned to Cleveland Thermal and is instead tempered with city water and then discharged to sanitary. The following graph shows the monthly steam consumption starting in January 2010 and ending in December 2012. Steam consumption typically peaks around 2,300 Mlbs in the coldest month of the year and drops to below 100 Mlbs during the summer months. This is indicative of a very low domestic hot water steam demand and good HVAC control practices to minimize use of steam in the summer for reheat.



District steam is used almost entirely for building heat; therefore, steam consumption should trend very closely with heating degree days (HDD). The chart below shows a regression analysis of district steam use and HDD since January 2010. The $R^2$ value indicates the strength of the correlation between steam use and HDD. The closer the $R^2$ value is to 1, the stronger the correlation. The $R^2$ value is 0.947, indicating a very strong correlation between steam use and HDD.

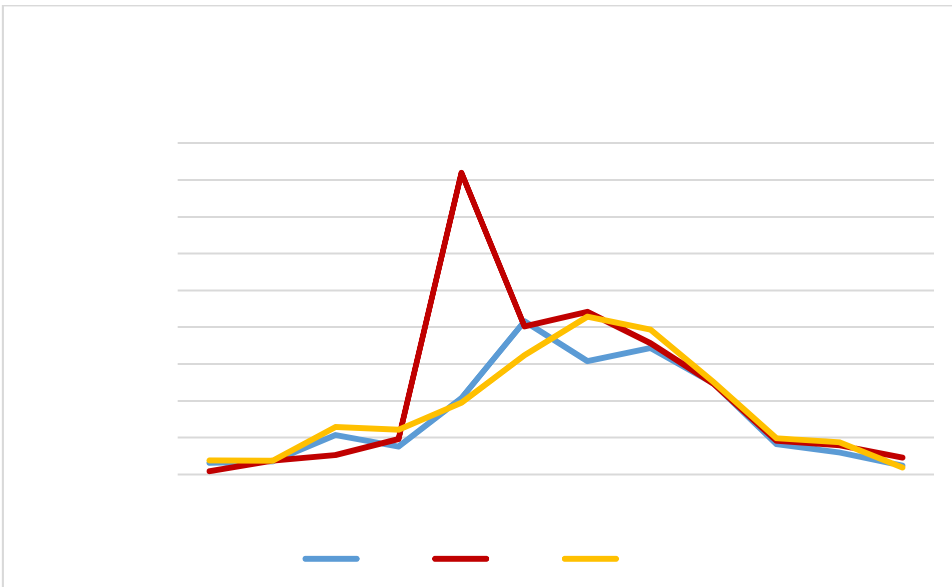


Since 2010, steam consumption has decreased in response to a corresponding decrease in heating degree days. This is indicated by the negative slope of both the steam use trend line and the heating degree trend line. Steam consumption has decreased at a slightly higher rate than heating degree days. This is likely a result of the demand drivers internal to the building such as occupancy, utilization, and efficiencies.

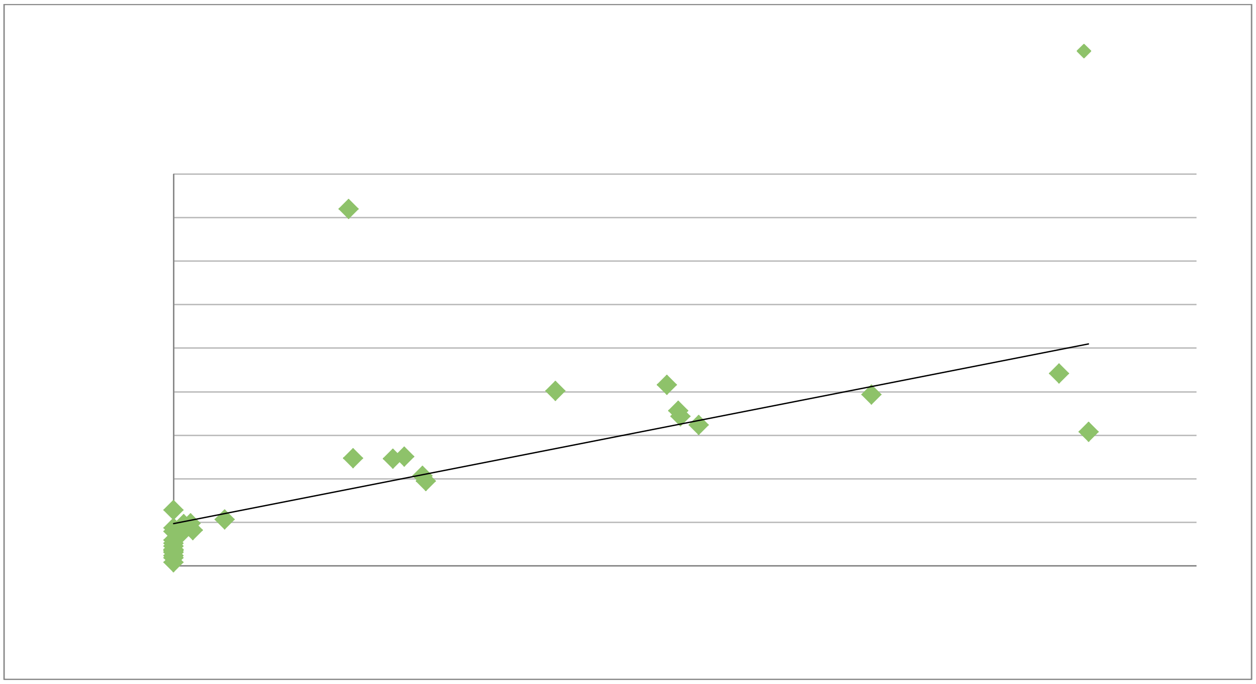


### 3.6. District Chilled Water Use

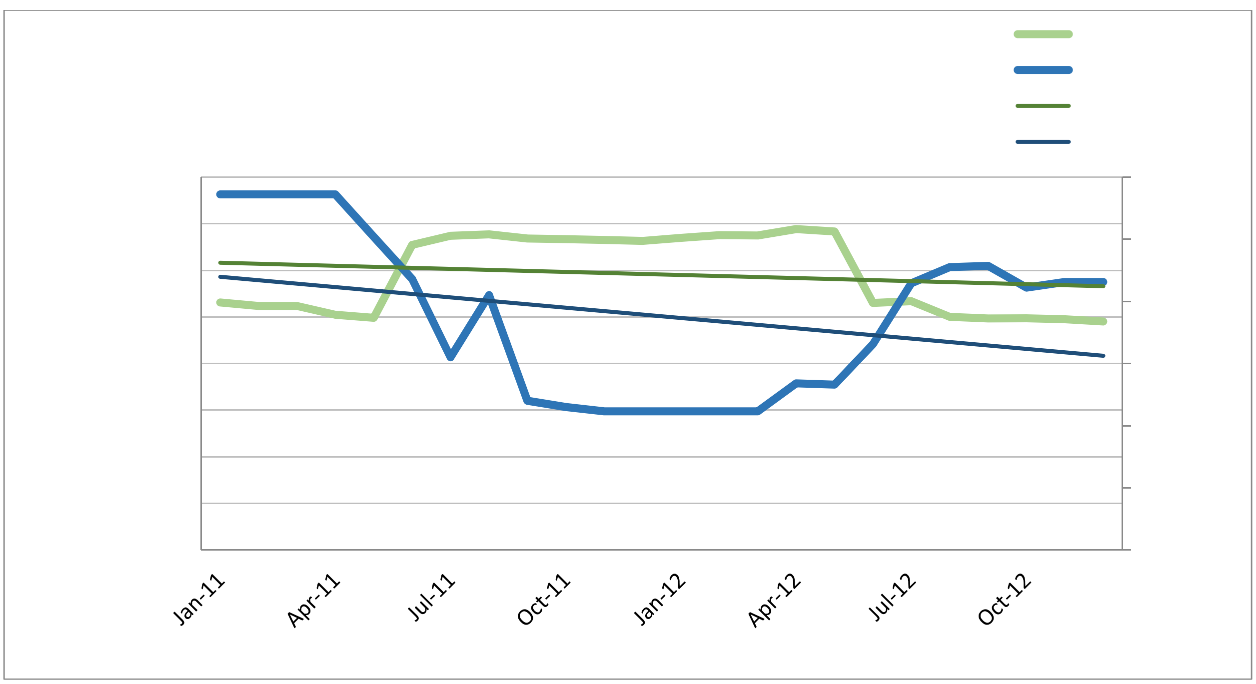
District chilled water is billed primarily based on monthly consumption with a relatively small capacity charge and rarely billed, low return water temperature penalty. The graph below shows monthly chilled water consumption starting in January 2010 and ending in December 2012. Consumption has remained relatively consistent, with the exception of an unusually high consumption in May 2011 which is twice the average consumption during the hottest summer months. The chilled water usage for this month during the other two years was 25% of this amount and therefore an anomaly that should not be taken in to account. It is possible that the utility data was incorrectly recorded or an operational issue causing the spike.



Chilled water is used solely for building cooling; therefore, chilled water consumption should trend very closely with cooling degree days. The chart below shows a regression analysis of district chilled water use and CDD since January 2010. The R2 value indicates the strength of the correlation between chilled water use and CDD. The closer the R2 value is to 1, the stronger the correlation. The R2 value is 0.5064, indicating a fairly low correlation between chilled water use and CDD. The R2 value is distorted due to the unusually high chilled water consumption in May 2011, for which there was not a high enough number of cooling degree days to justify the high energy usage. If the chilled water usage in May 2011 was similar to the consumption in 2010 and 2012 (100,000 ton-hours) the R2 value would be above 0.8, which would indicate a much higher correlation as expected.

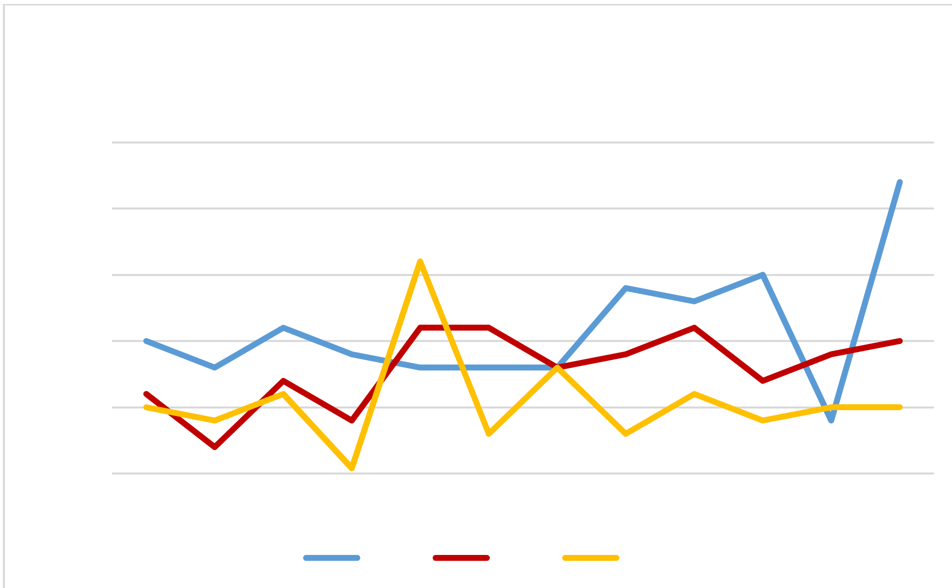


Since 2010, chilled water consumption has decreased marginally while cooling degree days have decreased at a slightly higher ate. This is indicated by the negative slope of both trend lines, with the negative slope of cooling degree days being slightly higher. The minor decrease in chilled water consumption is likely due to weather instead of efficiency improvements in the building.



### 3.7. Natural Gas Use

A very small amount of natural gas is consumed by the emergency generator. The natural gas consumption remained relatively steady, with a slight increase in December 2012. It does not appear that there were any major losses in power over the last three years that would require the generator's sustained operation.



Weather patterns were not analyzed for natural consumption since natural gas is only used by the generator and the generator's usage is not dependent on weather.

# Appendix D
# Safety Briefing Program

# Safety Briefing for

## Cuyahoga County Justice Center

**11 June 2013**

# Safety Topics

**Topics:**

- Common Sense
- Safe Practices
- On-Site Safety
- Prison Safety
- Appropriate Attire
- Protection from Environment
- PPE
- Ladder Safety
- Roof
- Electricity, Steam
- On-site Injuries

# Safety Common Sense

**Objective**

- To heighten awareness prior to entering a potentially hazardous environment and teach principles of Safety and Accident Prevention – remind you to use your common sense!

**Common Reasons for Accidents**

- Loss of Focus
- No situational awareness
- Not using required personal protective equipment
- Lack of Knowledge
- Inappropriate Behavior
- Slips, trips, and falls constitute the majority of general industry accidents.

# Safe Practices

**Do not come to work under the influence of alcohol or drugs**

**Many prescription and over-the-counter drugs will also make you drowsy and affect your level of awareness.**

- Do not work if medications affect your mental clarity
- Wear or carry medical alert information
- Carry medications
  - Anaphylactic shock
  - Heart / Blood Pressure Pills

# On-Site Safety

- Where applicable, get your escort's and POC's (Point of Contact) contact information;
- Follow your escort's and POC's instructions; and
- Ask for Clarification if you don't understand something

***<u>Always stay In line-of-sight with your escort</u>***

## *Always stay In line-of-sight with your escort!*

- Do not enter an area without permission or supervision from your escort.
- If entering an area out of sight, inform your escort.
- Do not interact with inmates including offering or accepting items. Any form of communication is discouraged. Do not respond verbally or physically to comments or hazing.
- Keep track of all brought items (cameras, pens, measuring tape, etc) and do not leave anything behind. Create an itemized list of all items you are taking in and check the list prior to leaving the facility.
- Use common sense.

# Appropriate Attire

- Do Wear Comfortable Walking or Safety Boots
- No Tennis Shoes, Sandals, or High Heels

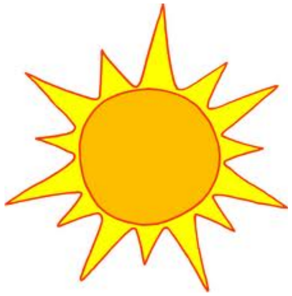
- Do not wear Jewelry, Ties, Loose Fitting Clothes
- Be aware of FOD (Foreign Object Debris)

- Do wear ID badge at All Times

# Protection From Environment

Sun/Heat

- Sunscreen, Hat, Eye Protection
- Cover Up with Light Colored Clothes
- Stay Hydrated -- 1 liter per hour

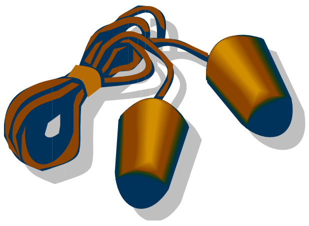


Cold/Rain

- Wear Appropriate Weight Clothing in Layers
- Be alert for thunderstorms, etc

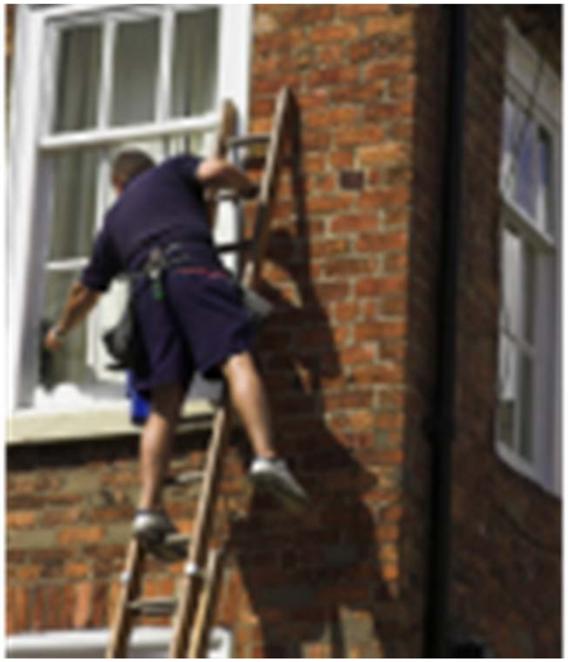
# PPE

- Use Personal Protection Equipment as seen fit.
- Hard hats in construction zones as required.
- Wear gloves to protect your hands from dirt and sharp objects.
- Eye and ear protection where necessary.
- Areas where there is a potential of foot damage due to falling objects require use of steel-toed boots



# Ladder Safety

- Use extreme caution when climbing ladders. Do not climb a ladder you believe to be unsafe.
- Verify soundness and stability
- Face the ladder at all times.
- Wear appropriate protection
- One person per flight, make sure person is clear before ascending and descending
- Replace warning chain / signs
- Do not trail-blaze
- Do NOT use a metal ladder within 4 feet of any electrical equipment



# Roof

Keep 6 feet from unprotected edge

Stay off obviously damaged areas

Beware of tripping hazards
- Anti-lightning, Machinery
- Piping, Slippery Areas

# Electricity, Steam

Electric

- One-hand rule, nothing else grounded
- Do not point

Steam (where present)

- Verify Known Leaks
- Wear Appropriate Protection

# On-site Injuries

**Report All Injuries, No Matter How Minor**

- Report immediately to your Team Lead, Escort, and/or POC.
- Inform your company of the injury.
- What appears to be a minor injury can later develop into something more serious.
- You will want to have it documented that the injury did happen on the job.

# Appendix E
# Best Practices



# Purpose

Cuyahoga County and the City of Cleveland have requested a professional assessment of the Cuyahoga County Justice Center Facility and the City of Cleveland Police Headquarters. The assessment is to include a full assessment of its operations, physical layout, and recommendations for upgrades to the facility which will enable the buildings to function more effectively and efficiently going forward. A comprehensive facility conditions assessment was conducted by assessment teams of architects, engineers, and building specialists who reviewed the current building conditions, deficiencies, maintenance operations, technology, and security operations.

This overall assessment provides County and City facility results, observations, costing, lessons learned / best practices, capital plan, and suggestions for future improvements to the facility. The purpose of this Chapter is to memorialize the observed lessons learned / best practices the assessment team recommends moving forward. Assessment teams and facility maintenance staff discussed these observations during site visits. These discussions have been summarized below by discipline including building envelope, structural, building interiors, mechanical / plumbing, electrical, technology, and fire protection.

The following maintenance approaches are used in this document:

- **<u>Reactive Maintenance</u>**: defined as a "wait until something fails" maintenance approach. No actions or efforts are taken to maintain a component of the facility prior to failure. Based on the assessment, this approach is the most dominant approach used in the Justice Center and Police Headquarters. This approach has a limited budget impact. **We recommend continuing to use this approach; replacing those elements only as they fail.**
- **<u>Preventive Maintenance</u>**: Actions are performed on a time-based schedule. Use of the schedule detects, precludes, and/or mitigates deterioration of a component or system with the aim of sustaining, or extending an item's useful life through controlling deterioration at an acceptable level. By performing preventive maintenance, the life of the structure may be extended closer to its full design life. This approach permits cost savings as elements are maintained and can be used until end-of-life. **We recommend preventative maintenance be used on elements nearing the end of their warranty periods, building envelope, and motorized equipment.**
- **<u>Predictive Maintenance</u>**: predictive maintenance differs from preventive maintenance by basing maintenance needs on the actual condition of the structure rather than on a pre-determined schedule. The advantages of predictive maintenance include: A well-planned predictive maintenance program may nearly eliminate failures; maintenance activities can be scheduled to minimize or delete overtime cost; and Repairs can be performed and scheduled as required to support downstream maintenance. This approach can optimize operations within the structure, increasing reliability, and reduce costs. We recommend that the proactive practice of predictive maintenance be used on new elements installed in the building moving forward. The facility maintenance superintendent could be the overseer of this program to ensure its successful implementation.

Predictive maintenance is the optimum course of maintenance for any facility. Training for staff, organizational strategies, programming, and scheduling are necessary to implement predictive maintenance effectively. Predictive maintenance generally includes:

- An overview of maintenance practices
- Why a preventive maintenance program is necessary
- How to establish a preventive maintenance program
- Comparing outsourcing vs. in-house staffing
- Manual recordkeeping vs. a computerized maintenance management system
- Guide to identifying and tagging equipment and systems
- How to schedule preventative maintenance
- How much time to allow for preventive maintenance tasks
- Staff requirements to operate a facility and perform preventive maintenance
- Principles of capital planning and sample analysis
- Expected useful life of building systems
- Industry standard preventive maintenance tasks and tools
- What non-destructive preventive maintenance is and which systems it can benefit
- What predictive maintenance is and how it can save you money

Additionally, when contemplating a significant renovation the “P100 Facilities Standards for the Public Buildings Service” published in November 2010 by the U.S. General Services Administration could be used as a design guide. The Facilities Standards for the Public Buildings Service (P-100) “establishes design standards and criteria for new buildings, major and minor alterations, and work in historic structures for the Public Buildings Service (PBS) of the General Services Administration (GSA). This document contains policy and technical criteria to be used in the programming, design, and documentation of buildings. The guide may help to better inform decision making throughout the project process.”[1]

**Best Practices**

“A best practice is a technique or methodology that, through experience and research, has proven to reliably lead to a desired result. A commitment to using the best practices in any field is a commitment to using all the knowledge and technology at one's disposal to ensure success.”[2]

The following are specific areas within the Justice Center complex that our team recognized as lessons learned / best practices.

**Building Envelope**

Façade:

The facades of the Court Tower (CT), Jail 1 (J1), Atrium (AT) and the Cleveland Police (CP) buildings are all of similar construction using granite panels mechanically fastened to the structure with soft joints

[1] http://www.gsa.gov
[2] http://searchsoftwarequality.techtarget.com/definition/best-practice

between panels. Jail 2 (J2) has precast concrete panels instead of granite. The following are best practices to consider:

- Implement a regular inspection of facades. We recommend preventative maintenance to include an annual visual inspection from grade and/or rooftops and staged inspections every five years. The result of the inspections will dictate annual maintenance work and establish proactive measures to prevent additional future repairs.
- Sealant joint material has a finite life cycle and requires replacements before the material fails to prevent water infiltration. Currently all sealant joints for all five structures are in an aged and/or failed condition, requiring replacement. Replacement includes preparing the joint by removing all existing caulk and cleaning joints for proper adhesion. To determine the proper sealant material, it is recommended that each sealant material be tested in a mock-up prior to large scale implementation to ensure good adhesion without staining or color bleeding.
    - There are two types of sealant that may be appropriate: Urethane or Silicone. Both products have similar elongation and adhesive properties and installation costs are comparable. Urethanes typically start to deteriorate within seven years and should be budgeted for accordingly. Silicone based joints have a longer service life and should be budgeted for replacement every ten years. Annual inspections will help prolong sealant use by identifying repair needs and directing replacements to areas on an as-needed basis.
- The granite and precast concrete panels should be cleaned and water repelled every five years. This is especially relevant on the granite structures based on the spalling, cracking, and cupping identified. It is recommended that various water repellant materials be tested prior to large scale implementation ensure repellency without staining the substrate.

<u>Roofs</u>
We recommend a scheduled preventative maintenance program for all roofs. The program should be implemented annually or bi-annually if possible. At a minimum all drains should be inspected and cleaned bi-annually, simultaneously, removal of debris and/or vegetation should occur. Visual inspections of flashings and roof membranes should be conducted annually and any identified repairs made as they are discovered. All areas of potential leaks around penetrations, pitch pockets, and flashings should be inspected bi-annually. Caulking and sealants for roof elements should be reviewed annually.

<u>Plaza Decks</u>
The pavers and drains should be inspected and cleaned of debris monthly to ensure that water can freely flow down to the drains. The precast pavers should be inspected and any unbalanced or damaged pavers repaired or replaced to avoid tripping hazards. Flashings should be inspected annually and repairs made as needed.

<u>Hardscapes</u>
The pavers and concrete hardscapes surrounding the Justice Center should be visually inspected by facility maintenance staff quarterly. Each inspection should identify cracked and/or damaged concrete and pavers to be mitigated between inspection periods.

## Structural

A qualified registered professional structural engineer should be brought in to evaluate all new projects in the context of the existing structural system. The evaluation should identify deficiencies and maintenance issues which contribute to deterioration. Such maintenance issues may include: excessive wear of traffic surfaces, floor drainage system blockage, leakage from plumbing systems, and other damage to the concrete structure.

- The last known concrete repairs were executed on or about 2001. We recommend a comprehensive periodic assessment and maintenance program be implemented. Preventive maintenance will not prevent all deterioration but should decrease the number and severity of repairs. The appropriate maintenance approach should be determined by appropriate staff. Minimizing deterioration translates into maintenance and capital cost savings.
- The parking garage and other areas below grade of the courts tower and sheriff's office should be examined for evidence of water seepage. The source of the water whether ground water intruding from outside the structure, or plumbing leaks within the structures should be immediately identified and corrective measures taken to permanently correct the condition.
- Cleveland Police Headquarters Building: The design and construction of the reinforced concrete framing appears to conform to standards and guidelines of the American Concrete Institute (ACI). The reinforced concrete framing is in good to fair condition. Repairs to the concrete structure as performed circa 2000 appear to be in good condition. However, the traffic coating on the concrete structure has deteriorated and the debris is now blocking the floor drainage system. Future repairs should be held to similar or better standards to ensure the integrity of the structure throughout the design life of the facility. The condition of the concrete framing areas should be assessed at regular two to three year intervals in an effort to address potential problems prior to the need for extensive repairs. The condition of traffic coating systems should be assessed every one to two years.
- The lowest level of all the parking garages and basement areas throughout the Cuyahoga County Justice Center Complex are comprised of structural mat foundations of varying thickness. In Jail II a concrete slab (basement floor level) is placed several feet above the mat foundation with fill located between the mat and slab. All future projects that include modifications to the mat or slab / mat combination should include an allowance for ground water removal / mitigation. Past projects have found the need to include grout injection around the entire perimeter of the opening along, providing a sump and pump for water removal, and temporary shoring; the order of magnitude cost associated with this type of water mitigation is approximately between \$100 to \$150 per square foot and will depend on the geometry of the modification. Note: Grout injection with sump pump is only one potential method to resolve the water infiltration issue.

**Building Interiors**

<u>Janitorial</u>

- Janitorial/Cleaning — using environmentally friendly cleaning products and incorporating safer methods to clean buildings provides a better property asset management and creates a healthier workplace. Grounds maintenance and proper cleaning of exterior surfaces are also important to effective overall facility maintenance and cleaning program.

<u>Fixed Partitions / Demountable Partitions</u>

- Patch, sand, and repaint areas when damaged to keep up a proper facility appearance.
- General maintenance such as lubrication, operation, and cleaning of demountable partitions.

<u>Interior Doors</u>

- Routinely check that door hardware is functioning properly. Adjust closers to comply with ANSI standards for accessibility (closing time and opening pressure), verify attachments to frames/doors, door latch/locks are able to be operated properly, and proper functionality of any door access controls, etc.
- Door hardware should have lever style hardware at all locations.
- Establish a maintenance schedule for refinishing and verifying condition of sealant on doors/frames on a yearly basis.

<u>Specialty Doors (Detention Doors)</u>

- Routinely check that door hardware is functioning properly including lock, door position switch, closer, sliding mechanism, and ports.
- Establish a maintenance schedule for refinishing and verifying condition of sealant on doors/frames on a yearly basis.
- Verify proper functionality of all door electronics with the control system.

<u>Interior Windows</u>

- Replace any glazing when damaged.

<u>Floor Finishes</u>

- Design and select flooring material based on traffic use, durability required, lifetime expectancy, and budget.
  - Heavy traffic
    - Public Areas - durable, easily cleanable, easily replaceable in small portions, low maintenance, fully adhered, typically a hard surface, and thru color.
  - Medium traffic – provide materials suitable for area:
    - Office – carpet to reduce noise, provide carpet tile for easy replacement, pile height to allow easy wheelchair access.
    - Hallways/Corridors – provide more durable surface, carpet tile to allow easy replacement if required.
    - Building Support – leave floors in original condition (i.e. subfloor if concrete) or install a vinyl type material that is easily cleanable. Other options include ceramic, quarry, or porcelain tiles.
  - Light traffic

        - Maintenance Areas, etc. – provide durable coating or just sealed concrete, easily cleanable, low maintenance.
    - Detention Areas
        - Durable coatings that provide a long life span, low maintenance, easily cleanable, and easily re-coated.
    - Kitchen Areas
        - Durable, chemical resistant, sanitary, easily cleanable, slip resistant materials.
- Create a schedule for floor finish replacement.  Carpet to be replaced every 10 years, vinyl tile every 15-20 years, and hard tile every 25 years.

<u>Wall Finishes</u>
- Leverage janitorial staff to clean walls that are marred or marked on a daily basis (public areas).
- Create a schedule for wall finish replacement.  Painting to occur every 5-7 years. The jail this may require an increased level of maintenance.
- Use full height tile on all wet walls.  Seal all tile and grout when used.

<u>Interior Coatings and Specialty Finishes</u>
- Routine maintenance on existing granite to ensure proper anchorage. Replace any cracked/broken granite as required.
- Refinish as required.

<u>Ceiling Finishes - </u>Look for the root cause of the failure and inform other building trades to remedy the issue prior to fixing the damaged area.  Many times ceiling staining is an occurrence of a leaking pipe or exterior envelope failure.

- Repair failing areas of ceiling.
- Replace stained and/or deteriorated tiles as required.
- Create a schedule for ceiling finish replacement.  Painting to occur every 10 years.
- Replace concealed spline ceilings with ACT as the facility is renovated.
- Refinish grids, hard ceilings, etc. when ceiling tile is replaced in an overall area.

<u>Bathrooms</u>
- Repair any broken/out of service fixtures. Ensure proper anchorage to wall/floor.
- Review ADA compliance for restrooms indicated as "ADA Compliant." Confirm requirements meet the County's Universal Design Guidelines and applicable codes such as ANSI.
- Repair/replace/refinish all finishes as required.
- Provide washable surfaces on walls at fixtures/vanities (wet areas) to provide extended life to wall partitions.

<u>Food Service and Laundry Equipment</u>
- Repair existing nonfunctional equipment as required.
    - Conduct a financial analysis to determine whether the item should be repaired or replaced.  This may depend on the availability of parts, serviceability, energy efficiency, and ongoing maintenance required
- Yearly servicing of equipment per manufacturer recommendations.  May require specific shut-down periods to be planned in order to conduct maintenance.

Detention Equipment

- Routinely check that it is properly anchored to wall/floor.
- Replace/repair any broken equipment.
- Refinish equipment as required.

Escalators, Elevators and Lifts

- Clean any leaked oil from adjacent surfaces before deterioration / contamination occurs.
- Conduct regular maintenance reviews of all equipment.

**Mechanical / Plumbing**

It is recommended that the entire mechanical system be replaced. Below are best practices related to mechanical systems; they include: mechanical system design, construction, and implementation. These items include, but are not limited to:

- Independent or independently controlled HVAC equipment should be installed to serve areas with off-hour loads, including but not limited to the following:
    - Judges Chambers
    - Audiovisual Rooms
    - Server Rooms
    - Trial Jury Suite
    - Grand Jury Suite
- Use variable air volume distribution for off-hours flexibility, temperature control, air quality, and acoustic advantages.
- Within a Courtroom a minimum of three (3) thermostatic zones should be provided as follows:
    - Judge and attorney area
    - Jury area
    - Spectator area
- The spectator area HVAC should be designed to accommodate the maximum allowable seating area plus 25% to accommodate extra seating.
- Air distribution on court floors should be designed to provide a high degree of individual control and acoustical privacy.
- Server, Telecommunication, and Audiovisual Rooms
    - These rooms should include a supplementary cooling system to provide proper air conditioning while the main building mechanical systems are shut down.
    - HVAC should be designed for a minimum of 60 watts per sf of power density.
    - BAS should monitor and alarm the following: high temperature, smoke, HVAC equipment trouble alarm.
- HVAC should be designed for the following peak supply air volume at 55°F .
    - Courtroom: 10 air changes per hour
    - Conference Room: 8 air changes per hour
    - Jury Room: 8 air changes per hour
    - Library Spaces: 8 air changes per hour
- Outdoor Design Criteria:

    - Outdoor air design criteria must be based on weather data tabulated in the latest edition of the ASHRAE Handbook of Fundamentals. Winter design conditions must be based on the 99.6% dry bulb wet-bulb temperature.
    - Summer design conditions for sensible heat load calculations must be based on the 0.4% dry-bulb temperature with its mean coincident wet bulb temperature.
    - Summer design conditions for summer ventilation load, cooling tower selection and all dehumidification load calculations must be based on the 0.4% dew point with its mean coincident dry-bulb temperature.
- Indoor Design Criteria. Indoor design temperature and relative humidity requirements should be 75°F in summer and 72°F in the winter for normally occupied spaces and should be maintained at these values to within 18 inches of the exterior wall surfaces.
- Indoor Air Quality. Either the Ventilation Rate Procedure (Section 6.2) or the Indoor Air Quality Procedure (Section 6.3), specified in ASHRAE Standard 62.1-2010 should be used as the basis of design.
- HVAC Controls / Building Automation System (BAS):
    - For new construction as well as alteration projects, use direct digital controls with an open BACnet protocol and integrate existing systems to the new BACnet front end.
    - Integrate BAS design with technology systems.
    - The BAS must include programs for scheduled maintenance of the mechanical and electrical equipment, including information regarding the parts and tools needed to perform each task.
- Locate all air intakes a minimum of 40 feet above ground level to minimize the introduction of hazardous objects or substances.
- The use of ductboard or internal duct lining is not permitted in supply air ductwork.
- Water Closets should be either dual flush or low-flow type (1.28 gal/flush).
- Urinals should be pint (0.125 gal) flush.

Recommended Best Practices after renovation of the mechanical system at the Justice Center:

- Use of questionnaires or surveys to capture building occupant concerns and begin resolution of any issues.
- The mechanical system should be balanced after full occupancy to acclimate the mechanical system to additional thermal loads. It is likely that thermal loads will changes after full occupancy is achieved.
- Manufacturer-provided training regarding the system for O & M personnel.
- O&M personnel scheduled walkthroughs of future facilities during construction phases.
- Follow-up training 6-8 months post occupancy with the manufacturer. This will provide technicians time to use and acclimate to the facility's systems. These tasks may be implemented through specification requirements per building systems training
- All new construction and major renovation projects should undergo a total building commissioning process. The Commissioning Agent should directly perform testing and verification of performance on the equipment to verify compliance with the design and County / City requirements. For best results, the Commissioning Agent should represent the County / City rather than the Contractor, in order to ensure County / City interests are paramount in the process. The Commissioning Agent should have an outside accreditation (i.e. Building Commissioning Association, American Air Balance Council, etc.).

- Benefits of Commissioning for Buildings – "Because all building systems are integrated, a deficiency in one or more components can result in suboptimal operation and performance among other components."[3] Remedying these deficiencies can result in a variety of benefits including:

- Improved building occupant productivity
- Lower utility bills through energy savings
- Increased occupant and owner satisfaction
- Enhanced environmental/health conditions and occupant comfort
- Improved system and equipment function
- Improved building operation and maintenance
- Increased occupant safety
- Better building documentation
- Shortened occupancy transition period
- Significant extension of equipment/systems life cycle

- Given the high rate of sedimentation in the Cleveland water, sedimentation can accumulate in the piping of buildings that use low flow plumbing fixtures, particularly during weekends and holidays when even less water is used. A periodic flush-out of water upstream of the potable water main, preferably at the low point of the system, is recommended every few months to remove sedimentation that can clog plumbing fixtures.

**ELECTRICAL**

It is important to get feedback from maintenance personnel when beginning an electrical project. Questions that may be asked include:

- Is sufficient space allowed for proper working around and access to electrical equipment?
- Are light fixtures located where easily maintained?
- Are long life light sources being considered to lower maintenance costs?

<u>General</u>

National Fire Protection Association (NFPA) 70B and 70E address creating and implementing preventative maintenance in electrical systems. The facilities maintenance electrical trades read, train, and implement these best practices. We recommend implementing the NFPA 70B and 70E maintenance programs. This program will help reduce accidents, avoid costly breakdowns, disruptions, and stoppages.

- The advantages of predictive maintenance are many. A well-planned, predictive maintenance program may nearly eliminate catastrophic equipment failures. Maintenance activities can be scheduled to minimize or delete overtime cost. Parts can be ordered as required or well ahead of time to support downstream maintenance. This can optimize the operation of the equipment, saving energy cost and increase reliability.

[3] http://www.gsa.gov/portal/category/21596

Analyzing failures as well as successes is imperative to developing a world-class maintenance program. This analysis occurs using practices such as “Root Cause Analysis” or “Failure Reporting Analysis and Corrective Action System.”

Electrical Rooms

There were multiple instances of electrical rooms that had become "storage rooms." This suggested that equipment had not been cleaned or exercised for years, and contained equipment that exceeded its design life. Electrical equipment rooms should never be used as storage areas.

Electrical equipment rooms or vaults should be kept cleaned of dirt and/or dust accumulations on a regular basis. Doors and windows should be maintained in proper working order and kept closed during routine operation. Access doors should be clearly marked to alert personnel that live electrical equipment is in use.

Where ventilation and/or air conditioning are used, all fan motors should be cleaned and examined for signs of wear and deterioration. Fans should be cleaned of dirt and dust, and bearings should be properly lubricated. Vent openings should be cleaned of all dust and dirt accumulations. Filters should be cleaned and/or changed as recommended by the manufacturer or more often if conditions warrant.

Electrical equipment rooms or vaults should be examined for water seepage. The tops of electrical equipment enclosures should be examined for evidence of water since this is a common entryway that often goes undetected until a failure occurs. The source of the water should be immediately identified and corrective measures taken to permanently correct the condition.

Circuit Breakers

The majority of the over-current protective devices throughout the Justice Center are molded case circuit breakers. Molded-case circuit breakers should be kept clean for proper ventilation of the breakers. These types of breakers are usually tripped by a thermal element that senses an increase in temperature due to excessive current draw. However, if dirt accumulates on the surrounding of the breaker, the heat build-up may not be permitted to dissipate properly and result in nuisance tripping.
Breaker housings should be cleaned and inspected for cracks or signs of overheating. All connections should be tightened and the breaker exercised several times per year to ensure the mechanism has freedom of movement.

In addition, larger circuit breakers (225 amps or above) should be electrically trip tested to ensure proper operation of the trip elements and trip linkages.

It is typically recommended that a frequency of once every three years to conduct regular preventive maintenance on molded case circuit breakers is acceptable.

All circuit breaker panels should be cleaned of dirt, dust, and debris using a vacuum.

Medium voltage breakers should be examined and have manufacturer recommended maintenance performed yearly.

<u>Conduits/Raceways</u>
Raceways should be checked for proper mechanical support. Examine raceway joints for clean and tight connections.

<u>Lighting</u>
To assure lighting quality, whether for task performance, safety, or aesthetic reasons, proper maintenance is required. Lack of maintenance can have a negative effect on energy usage, human performance, perception of an area, safety, and security. The combined effect of equipment age and dirt depreciation can reduce luminance by 25% to 50% or more depending on the application and equipment used.

Predictive Maintenance for Lighting Systems:

- Group re-lamping – Group re-lamping requires replacement of all lamps in a system together after a fixed interval. Group re-lamping can reduce the cost of operating a lighting system while keeping luminance levels close to the design value.
- Periodic planned cleaning – Cleaning the lighting system usually entails washing or otherwise removing dirt from the luminaries and occasionally cleaning air supply vents to prevent unnecessary dirt distribution.

<u>Summary</u>
The electrical preventive maintenance program should be well-documented as to scope and frequency of maintenance.

- All routine maintenance activities and the results of routine testing for trending purposes should be recorded.
- All repair and/or replacement of electrical components should be documented.
- When changes are made to the electrical distribution system all applicable drawings and maintenance schedules should be updated to reflect the changes.
- Spare parts inventories must be updated for new equipment based on the manufacturer's recommendations.

A committed plan for the electrical maintenance program must be developed. Operations and support personnel should participate in the process; the plan must be reviewed and agreed upon by all parties and then implemented as quickly as possible.

**TECHNOLOGY**

We recommend a cohesive approach to technology infrastructure within the Justice Center. Currently, a significant amount of the facility is provided base technological infrastructure from the County. However, there are multiple areas where the services and infrastructure are supplied and maintained completely outside of the County IT group. There does not appear to be any commonality in the requirements made by the County or the tenants.

While some of the tenants are operationally autonomous, requiring varied levels of security or other unique characteristics, it would be important to establish a cohesive technology infrastructure. This could include: establishing a level of expectation for certain aspects of a tenant fit out, a requirement of tenants to supply certain types and amounts of information, and an explanation regarding how the infrastructure is used. This information may help the County appropriately monitor the services provided, as well as plan for future expansions, renovations and maintenance. By establishing a consistent model for any tenant, it would be easier for the County to implement a fit out of a tenant's space by simply presenting these predefined choices and implementing the required services and infrastructure as agreed in a predetermined and methodical fashion.

Pathways and Spaces

It is recommended that the County establish new telecommunications rooms as the distribution points for voice, data, and other technology services. It is suggested that new telecommunications rooms should start with the first floor of Jail 1 and the building entry in the parking garage under CPD's tower.

- The spaces should have provisions for power, lighting and cooling that are consistent with the latest standards published by BICSI and the EIA/TIA.
- From these new telecomm rooms, new pathways both vertically throughout each of the towers, as well as horizontally traversing each of the floors, should be created to distribute the cabling. These include new cable tray or other universally accessible pathways.

With the basis of standardized pathways and spaces, future renovation can be more easily accommodated from infrastructure that is both current and adaptable.

Data/Voice Cabling

The County should have a standard expectation of data/voice cabling, including the installation and materials used for the system. With a common material and quality of installation requirement, a base expectation as to a space's ability to handle systems and personnel can be maintained.

A definition of what is not acceptable should also be established to prevent modifications that are not aligned with the County's expectations. Modifications can at a minimum be disruptive or at a greater extreme, catastrophic to the equipment that the County / City provide to service these tenants.

As new data / voice cabling is run above ceiling cabling not currently in use, it should be removed and discarded.

Network Switching

The County as a whole has established a successful standard network switching architecture in both County areas and areas in which the County provides the underlying network switching. A valid argument can be made that any given tenant not explicitly managed by County IT should be free to select their own network electronics. However, the County should create a Service Level Agreement (SLA) which will establish rules and expectations for tenants and the County. This will assist the County in preventing network from user driven service interruptions.

Telephone Services

The generations of telephony equipment spans the range of all available technology across the total life span of the building. Given the significant shift of the marketplace to a Voice over IP (VoIP) friendly environment, and the existing establishment of the County on a VoIP telephony platform, the easiest method for the facility would be to migrate to a complete VoIP facility. The County should provide whatever level of individually based services to various tenants in the complex. Though there are multiple “tenants” as previously mentioned, virtually all functions of the building are inter-related. A singular unified platform based on the existing Cisco VoIP platform could provide easy interoperability of the telephony services between the various tenants and the County. In addition, it could provide additional features not currently enjoyed by many of the users that are currently still operating in a Centrex environment. Certainly a restructuring of the model for these multiple disparate telephony customers should prove to be both economically viable and significantly more efficient if modeled properly. This unification of telephony environment would also assist in facilitating a unification of the data/voice cabling also previously mentioned.

Audio Visual

The requirements and expectations of audio visual equipment are as diverse as the groups that require their use. However, in the overall operations of the facility, two predominant factors prevail:

- 1. There is/has been ongoing development in the use of remote arraignment and prosecution; and
- 2. There has been and continues to be evolution in the gathering, storing and presentation of evidence.

Both of these are rooted in multi-media. Given the trends in audio visual technology, creation and distribution of this content should use and be based on the use of standard Ethernet and IP technology.

As is present in the construction of many of today’s court facilities, provision of multi-media presentation systems, video conferencing and audio visual capture in the courtrooms, as well as the various break out and support spaces, is virtually mandatory. Other audio visual technologies, such as controlled sound masking to facilitate bench side bar conversations should also be included. Providing the required room control and a robust network behind these audio visual and other court technology enhancements are needed to assure the ability to transport the content across the County network.

Summary

It is incumbent to create a strong data/communications infrastructure to allow efficient and effective operation of the facility. There needs to be a change in the perspective recognizing the critical nature of the technology infrastructure in this complex. In a communications laden society, the use of multiple sources of content and means of communication in all of the aspects of this facilities core operation require that a good wired and wireless infrastructure be established. Once this foundational layer of technology is implemented, further development and implementation of systemic standards such as the use and leveraging of the County’s VoIP telephony, and implementation of common standardized A/V equipment, will create a facility that is adapt to changes as they develop.

Along with establishing a solid underlying infrastructure, we recommend an operational model where the County moves from a major facilitator in the building into the sole technology provider within these facilities.

**Fire Protection**

As a general rule any modification to the building should include a review of the fire protection in the area affected and update or revise the systems accordingly. Specific areas of note include:

- If a large area of a floor or an entire floor of the building is remodeled, sprinkler protection should be added (fed from existing standpipes) to bring that area up to current code requirements and improve the life safety for building occupants.
- Fire pump tests need to be more complete with the information required by NFPA 20 and 25 recorded on the forms.
- Dry sprinkler system valves should have signage for ease of maintenance.
- Copies of all test reports and inspections should be kept on file and sent to the Cleveland Fire Prevention bureau.
- All remodeling projects that include MEP should have sprinklers included.
- Require fire pump testing contractor to use current NFPA forms.
- Sprinkle all storage rooms with combustible or hazardous materials.

## CONCLUSION

No matter what lessons learned or best practices are recommended above, a comprehensive facility maintenance program must include the following:

- Preventative Maintenance Program (PMP)
- Qualified staff performing the work
- Training of qualified staff
- Appropriate levels of staff to complete the work
- Cooperation with third-party companies with specific expertise to supplement staff
- Safety first
- Establish performance goals and metrics to measure success and justify future funding
- An administrative team to ensure the implementation of the (PMP)
- Dedicated funding to support this initiative

# Appendix F
# Accessibility

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

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# Appendix G
# Security

# R.C. Section 149.433(B)(1) - Security Record

# R.C. Section 149.433(B)(1) - Security Record

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# Appendix H
# Conveyance

# Overview

Conveyance in the Justice Center Complex consists of multiple traction passenger elevators, traction service elevators and escalators in the Atrium building. There are passenger elevators serving the judges, low rise passenger elevators, high rise passenger elevators, service elevators, garage elevators, inmate elevators, passenger visitation elevators, and escalators which were all modernized in approximately 2002. The conveyance infrastructure currently has 20-25 years of service life remaining.

The five (5) traction elevators in Jail II and six (6) traction elevators in the Police Headquarters Building were installed in approximately 1996, and are no longer manufactured. As a result, the elevators are obsolete and have limited maintenance support available. We recommend modernizing these elevators during the full renovation of the Police Facility in Year 3-5. Costs associated with modernizing these units can be found in the capital costs listed in appendix H containing the full conveyance report.

# 1. Judges Elevators

The 4 Judges elevators were modernized in 2001. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Lift Net System** should be upgraded (Judges elevator machine room does have lift net however it is out dated and limited). Liftnet is a display elevator system status on multiple CRT screens anywhere in the building – security stations, lobby, engineering, machine room, all connected by simple twisted pair cabling. Provide mouse or CPU clock control of security features such as Selected Floor Lock-Out, Suspicious Person Return, Hospital Code Blue, VIP Service, Up/Down Peak, and Lobby Recall. Revitalize lobby using modern color CRT displays and keyboards to replace obsolete light bulb style lobby panels and key switches; no more light bulbs to change or key switches to break. Add new features easily without running any new wires. Trigger emergency audio and video alarms to allow immediate response to crisis situations. Interface to Lift-Net™ Voice. Log error type, car number, floor position, and system status whenever a fault occurs. Detect intermittent failures early, before they become big problems. Perform statistical analysis on hall response times and traffic patterns. Find the bottlenecks that are slowing system response. Optimize zone patterns for peak performance. **(Kone to provide pricing)**

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $120,000 to $180,000 for the bank of four high rise elevators depending on software required)**

**3D infrared door edges on the 4 Judges Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6” into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $20,000 for all four elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Pits need to be swept

**R.C. Section 149.433(B)(2) - Infrastructure Record**

## 2. Low Rise Elevators

The 6 Low Rise elevators were modernized approximately in 2002 (P04 was new install). The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Lift Net System** should be upgraded (Low rise elevator machine room does have lift net however it is out dated and limited). Liftnet is a display elevator system status on multiple CRT screens anywhere in the building – security stations, lobby, engineering, machine room, all connected by simple twisted pair cabling. Provide mouse or CPU clock control of security features such as Selected Floor Lock-Out, Suspicious Person Return, Hospital Code Blue, VIP Service, Up/Down Peak, and Lobby Recall. Revitalize lobby using modern color CRT displays and keyboards to replace obsolete light bulb style lobby panels and key switches; no more light bulbs to change or key switches to break. Add new features easily without running any new wires. Trigger emergency audio and video alarms to allow immediate response to crisis situations. Interface to Lift-Net™ Voice. Log error type, car number, floor position, and system status whenever a fault occurs. Detect intermittent failures early, before they become big problems. Perform statistical analysis on hall response times and traffic patterns. Find the bottlenecks that are slowing system response. Optimize zone patterns for peak performance. **(Kone to provide pricing)**

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $180,000 to $270,000 for the bank of four high rise elevators depending on software required)**

**3D infrared door edges on the 6 Low Rise Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $30,000 for all six elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Pits need to be swept

- P05 Doors need adjustment

**Destination-Dispatching**
With the recent selection of Schindler to provide ongoing maintenance of the County's elevator systems at the Justice Center our team is providing propriety material to install a destination-dispatch system in the Courts Tower elevators. We are recommending destination-dispatch system for the Courts building to resolve the long wait times experienced each day. The existing system which was modernized approximately 10 years ago is able to accept this system.

This destination-dispatch technology allows passengers to select their desired floor number before entering the elevator. A computer then groups those going to the same or nearby floors and a PORT screen message directs them to a specific elevator car. By grouping passengers with similar destinations, you can realize a significant number of benefits.

- Reduced number of elevator stops
- Increased speed and reduced time to destination
- Improved system efficiency and reduced energy usage
- Personalized elevator service for passengers with special needs
- Integrated access control
- Individualized transportation.

Individual passengers, whose destinations are typically entered via a PORT device, are assigned to elevators that take them to their desired floor in the most time-efficient manner. Special features, such as longer door-open times, audible and visual cues, are available for passengers with special needs. Additional benefits may include:

- Saves energy. More efficient traffic handling means fewer stops and starts, reducing energy demand.
- Adapts to existing equipment. Schindler Destination Interface links with most existing elevator controllers. It's a high-value, low cost solution for upgrading elevator performance.
- Increases traffic handling capacity. Schindler Destination Interface can increase system efficiency by up to 50% while reducing waiting times and improving service.
- Improves access control. Schindler Destination Interface uses patented RFID access technology to validate passenger access rights and provide individualized service. It can also interface with your security provider.
- Special operating modes. Schindler Destination Interface provides the ability to designate special cars for exclusive use with express travel. It also will provide for persons with special needs to meet or exceed accessibility requirements. Identification media, such as RFID cards, can be used to pre-assign destinations or limit access to certain zones of the building.

**R.C. Section 149.433(B)(2) - Infrastructure Record**

# R.C. Section 149.433(B)(2) - Infrastructure Record

## 3. High Rise Elevators

The 6 High rise elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

Lift Net System should be upgraded (High Rise elevator machine room does have lift net however it is out dated and limited. Liftnet is a display elevator system status on multiple CRT screens anywhere in the building – security stations, lobby, engineering, machine room, all connected by simple twisted pair cabling. Provide mouse or CPU clock control of security features such as Selected Floor Lock-Out, Suspicious Person Return, Hospital Code Blue, VIP Service, Up/Down Peak, and Lobby Recall. Revitalize lobby using modern color CRT displays and keyboards to replace obsolete light bulb style lobby panels and key switches; no more light bulbs to change or key switches to break. Add new features easily without running any new wires. Trigger emergency audio and video alarms to allow immediate response to crisis situations. Interface to Lift-Net™ Voice. Log error type, car number, floor position, and system status whenever a fault occurs. Detect intermittent failures early, before they become big problems. Perform statistical analysis on hall response times and traffic patterns. Find the bottlenecks that are slowing system response. Optimize zone patterns for peak performance.**(Kone to provide pricing)**

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $180,000 to $270,000 for the bank of six high rise elevators depending on software required)**

**3D infrared door edges on the 6 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $30,000 for all six elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained

**Destination-Dispatching**

With the recent selection of Schindler to provide ongoing maintenance of the County's elevator systems at the Justice Center our team is providing propriety material to install a destination-dispatch system in the Courts Tower elevators. We are recommending destination-dispatch system for the Courts building to resolve the long wait times experienced each day. The existing system which was modernized approximately 10 years ago is able to accept this system.

This destination-dispatch technology allows passengers to select their desired floor number before entering the elevator. A computer then groups those going to the same or nearby floors and a PORT screen message directs them to a specific elevator car. By grouping passengers with similar destinations, you can realize a significant number of benefits.

- Reduced number of elevator stops
- Increased speed and reduced time to destination
- Improved system efficiency and reduced energy usage
- Personalized elevator service for passengers with special needs
- Integrated access control
- Individualized transportation.

Individual passengers, whose destinations are typically entered via a PORT device, are assigned to elevators that take them to their desired floor in the most time-efficient manner. Special features, such as longer door-open times, audible and visual cues, are available for passengers with special needs. Additional benefits may include:

- Saves energy. More efficient traffic handling means fewer stops and starts, reducing energy demand.
- Adapts to existing equipment. Schindler Destination Interface links with most existing elevator controllers. It's a high-value, low cost solution for upgrading elevator performance.
- Increases traffic handling capacity. Schindler Destination Interface can increase system efficiency by up to 50% while reducing waiting times and improving service.
- Improves access control. Schindler Destination Interface uses patented RFID access technology to validate passenger access rights and provide individualized service. It can also interface with your security provider.
- Special operating modes. Schindler Destination Interface provides the ability to designate special cars for exclusive use with express travel. It also will provide for persons with special needs to meet or exceed accessibility requirements. Identification media, such as RFID cards, can be used to pre-assign destinations or limit access to certain zones of the building.

**R.C. Section 149.433(B)(2) - Infrastructure Record**

# R.C. Section 149.433(B)(2) - Infrastructure Record

## 4. P13 and P14

The 2 elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $35,000 to $45,000 per elevator and $70,000 to $90,000 for the bank of two elevators depending on software required)**

**3D infrared door edges on the 6 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for the two elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained

R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

## 5. Service Cars S1 and S2

The two service elevators were modernized in 2002 (6394 new install). The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $60,000 to $90,000 for the two service elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for S1 and S2 elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Machine room Door needs to be self closing and locking

R.C. Section 149.433(B)(2) - Infrastructure Record

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## 6. Service Cars S3 and S4

The two service elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $60,000 to $90,000 for the bank of six high rise elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for S1 and S2 elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Pits need to be swept
- Machine room door needs to be self closing and locking

[redacted]

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## 7. Visitation 1 and 2

The two visitation elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $60,000 to $90,000 for the two visitation elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for S1 and S2 elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Machine room Door needs to be self closing and locking

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## 8. Jail 2

The five jail elevators were installed in the early 1990's with Serge elevator controls. Serge Elevators are no longer being manufactured and have limited support. These units should be modernized within the next two years.

**These five elevators are an operational and safety concern. While on site one unit was on the final limit twice in one day. These units should be equipped with rope grippers as soon as possible.**

**Water damage to Elevators 4 and 5 dry rotted the whisper flex (compensation chain and should be replaced) Kone to provide pricing**

**Elevators 1-3 currently have mechanical edges and should be replaced with 3D infrared door edges.**

**Major Upgrade**
When modernizing use a firm that manufacturers and installs their own equipment. The major elevator providers/ installers will have field and corporate support for the installation and maintenance. The nonproprietary firms do not provide the field support that a major elevator manufacturers/ installers can provide. This would include Controllers, Door Equipment, Infrared 3 D Door Edges, Fixtures and **Budget $200,000.00 per elevator or 1,000,000.00 for all five elevators.**

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $150,000 to $225,000 for the bank of five Jail 2 elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $25,000 for elevators**.

**ADA Guidelines**
**Jamb Braille** Raised and Braille Characters on Hoistway Entrances. All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs. The centerline of the characters shall be 60 in (1525 mm) above finish floor. Such characters shall be 2 in (50 mm) high and shall comply with

4.30.4. Permanently applied plates are acceptable if they are permanently fixed to the jambs. Budget $185 per landing/ per elevator or $9,850.00 for all five elevators 50 landings total.

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Pits need to be swept

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## 9. Garage Elevators G1 and G2

The two Garage elevators were modernized approximately in 2002(G01 new install). The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $60,000 to $90,000 for the two visitation elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for S1 and S2 elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained

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## 10. Inmate 1 and 2

The two Inmate elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $60,000 to $90,000 for the two visitation elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for S1 and S2 elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Pits need to be swept

**R.C. Section 149.433(B)(2) - Infrastructure Record**

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## 11. Inmate 3

The one Inmate elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years. **This elevator is not being used on a regular basis and was shut off during my survey. The county could save maintenance costs by properly landing this elevator (Remove ropes, Disconnect power feed, permanently close hoistway door and properly lower the car Budget $8,500)**

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator depending on software required)**

**3D infrared door edges on the 1 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00**

**Summary current condition:**
- Machine rooms are clean and equipment is well maintained
- Elevator pit needs non elevator components removed
- Elevator pit needs to be self closing and locking

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# R.C. Section 149.433(B)(2) - Infrastructure Record

## 12. Inmate 4 - Inmate 6

The three Inmate elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $90,000 to $135,000 for the two visitation elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $10,000 for S1 and S2 elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained

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## 13. Inmate 7-10

The four Inmate elevators were modernized approximately in 2002. The average life span of an elevator is 20-30 years. With proper maintenance these elevators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Rope Gripper** is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. **(Budget $30,000 to $45,000 per elevator and $120,000 to $180,000 for the four inmate elevators depending on software required)**

**3D infrared door edges on the 2 Passenger Elevators.** The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. **Budget $5,000.00 per elevator and $20,000.00 for the four inmate elevators**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- I09 Needs the hoist ropes replaced
- Pits need to be swept

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## 14. Escalators E01 to E12

The twelve escalators were modernized approximately in 2002. The average life span of an escalator is 20-30 years. With proper maintenance these escalators shouldn't have to be modernized for another 15-20 years.

**Additional Safety upgrades and possible code requirement**

**Summary current condition:**

- Machine rooms are clean and equipment is well maintained
- Pits need to be swept

**R.C. Section 149.433(B)(2) - Infrastructure Record**

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

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## 15. ADA – Which is a Civil Rights Act that became effective on January 26, 1992

- 2 way emergency communication is installed on each elevator
- Infrared door edge protection
- Hoistway doors currently have escutcheons on all floors, which allow hoistway access to trained emergency and elevator personnel.
- The existing handrail meets ADA requirements
- Car operating Panel – Does meet ADA requirements
- Hall Push Button Stations are set at 42”centerline which meets ADA code.
- Car Direction Lantern needs to have directional chimes, 1 chime for up and two chimes for down.
- Braille Plates for Hatch door jambs should be installed at 60”, no jamb Braille
- Braille needs to be installed on the Car operating floor for door open button and first floor

**Meet ADA requirements – (The existing elevator meet all codes at the time of installation).**

**4.10.1** General. Accessible elevators shall be on an accessible route and shall comply with 4.10 and with the ASME A17.1-1990, Safety Code for Elevators and Escalators. Freight elevators shall not be considered as meeting the requirements of this section unless the only elevators provided are used as combination passenger and freight elevators for the public and employees.

**4.10.2** Automatic Operation. Elevator operation shall be automatic. Each car shall be equipped with a self-leveling feature that will automatically bring the car to floor landings within a tolerance of 1/2 in (13 mm) under rated loading to zero loading conditions. This self-leveling feature shall be automatic and independent of the operating device and shall correct the over travel or under travel.

**4.10.3** Hall Call Buttons. Call buttons in elevator lobbies and halls shall be centered at 42 in (1065 mm) above the floor. Such call buttons shall have visual signals to indicate when each call is registered and when each call is answered. Call buttons shall be a minimum of 3/4 in (19 mm) in the smallest dimension. The button designating the up direction shall be on top. Buttons shall be raised or flush. Objects mounted beneath hall call buttons shall not project into the elevator lobby more than 4 in (100 mm). :

**4.10.4** Hall Lanterns. A visible and audible signal shall be provided at each hoistway entrance to indicate which car is answering a call. Audible signals shall sound once for the up direction and twice for the down direction or shall have verbal annunciators that say "up" or "down." Visible signals shall have the following features:

(1) Hall lantern fixtures shall be mounted so that their centerline is at least 72 in (1830 mm) above the lobby floor.

(2) Visual elements shall be at least 2-1/2 in (64 mm) in the smallest dimension.

(3) Signals shall be visible from the vicinity of the hall call button. In-car lanterns located in cars, visible from the vicinity of hall call buttons, and conforming to the above requirements, shall be acceptable.

**4.10.5** Raised and Braille Characters on Hoistway Entrances. All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs. The centerline of the characters shall be 60 in (1525 mm) above finish floor. Such characters shall be 2 in (50 mm) high and shall comply with 4.30.4. Permanently applied plates are acceptable if they are permanently fixed to the jambs.

**4.10.6*** Door Protective and Reopening Device. Elevator doors shall open and close automatically. They shall be provided with a reopening device that will stop and reopen a car door and hoistway door automatically if the door becomes obstructed by an object or person. The device shall be capable of completing these operations without requiring contact for an obstruction passing through the opening at heights of 5 in and 29 in (125 mm and 735 mm) above finish floor . Door reopening devices shall remain effective for at least 20 seconds. After such an interval, doors may close in accordance with the requirements of ASME A17.1-1990. –

**4.10.7*** Door and Signal Timing for Hall Calls. The minimum acceptable time from notification that a car is answering a call until the doors of that car start to close shall be calculated from the following equation:

For cars with in-car lanterns, T begins when the lantern is visible from the vicinity of hall call buttons and an audible signal is sounded. The minimum acceptable notification time shall be 5 seconds.

**4.10.8** Door Delay for Car Calls. The minimum time for elevator doors to remain fully open in response to a car call shall be 3 seconds.

**4.10.9** Floor Plan of Elevator Cars. The floor area of elevator cars shall provide space for wheelchair users to enter the car, maneuver within reach of controls, and exit from the car.

The clearance between the car platform sill and the edge of any hoistway landing shall be no greater than 1-1/4 in (32 mm).

**4.10.10** Floor Surfaces. Floor surfaces shall comply with 4.5.

**4.10.11** Illumination Levels. The level of illumination at the car controls, platform, and car threshold and landing sill shall be at least 5 footcandles (53.8 lux).

**4.10.12*** Car Controls. Elevator control panels shall have the following features:

(1) Buttons. All control buttons shall be at least 3/4 in (19 mm) in their smallest dimension. They shall be raised or flush.

(2) Tactile, Braille, and Visual Control Indicators. All control buttons shall be designated by Braille and by raised standard alphabet characters for letters, arabic characters for numerals, or standard symbols, and

as required in ASME A17.1-1990. Raised and Braille characters and symbols shall comply with 4.30. The call button for the main entry floor shall be designated by a raised star at the left of the floor designation. All raised designations for control buttons shall be placed immediately to the left of the button to which they apply. Applied plates, permanently attached, are an acceptable means to provide raised control designations. Floor buttons shall be provided with visual indicators to show when each call is registered. The visual indicators shall be extinguished when each call is answered.

(3) Height. All floor buttons shall be no higher than 54 in (1370 mm) above the finish floor for side approach and 48 in (1220 mm) for front approach. Emergency controls, including the emergency alarm and emergency stop, shall be grouped at the bottom of the panel and shall have their centerlines no less than 35 in (890 mm) above the finish floor.

(4) Location. Controls shall be located on a front wall if cars have center opening doors, and at the side wall or at the front wall next to the door if cars have side opening doors.

**4.10.13*** Car Position Indicators. In elevator cars, a visual car position indicator shall be provided above the car control panel or over the door to show the position of the elevator in the hoistway. As the car passes or stops at a floor served by the elevators, the corresponding numerals shall illuminate, and an audible signal shall sound. Numerals shall be a minimum of 1/2 in (13 mm) high. The audible signal shall be no less than 20 decibels with a frequency no higher than 1500 Hz. An automatic verbal announcement of the floor number at which a car stops or which a car passes may be substituted for the audible signal.

**4.10.14*** Emergency Communications. If provided, emergency two-way communication systems between the elevator and a point outside the hoistway shall comply with ASME A17.1-1990. The highest operable part of a two-way communication system shall be a maximum of 48 in (1220 mm) from the floor of the car. It shall be identified by a raised symbol and lettering complying with 4.30 and located adjacent to the device. If the system uses a handset then the length of the cord from the panel to the handset shall be at least 29 in (735 mm). If the system is located in a closed compartment the compartment door hardware shall conform to 4.27, Controls and Operating Mechanisms. The emergency intercommunication system shall not require voice communication.

**Performance Spreadsheet**

| Elevator Number | Up FPM | Down FPM | Accel Up | Accel Dn | Decel Up | Decel Dn | Jerk Up | Jerk Dn |
|---|---|---|---|---|---|---|---|---|
| JO1 | 498 FPM | 502 FPM | .07 | .08 | .05 | .07 | 7.8 | 6.3 |
| JO2 | 497 FPM | 500 FPM | .06 | .06 | .07 | .09 | 4.9 | 6.7 |
| JO3 | 493 FPM | 501 FPM | .08 | .09 | .08 | .08 | 3.9 | 4.7 |
| JO4 | 499 FPM | 504 FPM | .08 | .05 | .06 | .05 | 5.8 | 8.3 |
| P01 | 489 FPM | 498 FPM | .09 | .07 | .07 | .08 | 4.7 | 5.3 |
| P02 | 493 FPM | 502 FPM | .10 | .08 | .09 | .07 | 5.9 | 7.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P03 | 499 FPM | 501 FPM | .08 | .07 | .09 | .07 | 6.4 | 7.3 |
| P04 | 502 FPM | 503 FPM | .08 | .09 | .04 | .07 | 7.8 | 8.3 |
| P05 | 500 FPM | 501 FPM | .09 | .07 | .07 | .09 | 8.3 | 9.7 |
| P06 | 496 FPM | 498 FPM | .09 | .07 | .08 | .08 | 8.4 | 8.5 |
| P07 | 998 FPM | 1002 FPM | .07 | .09 | .08 | .09 | 8.9 | 9.3 |
| P08 | 996 FPM | 997 FPM | .07 | .09 | .06 | .06 | 9.3 | 9.9 |
| P09 | 998 FPM | 1005 FPM | .09 | .04 | .06 | .08 | 8.2 | 9.4 |
| P10 | 1000 FPM | 1001 FPM | .08 | .06 | .08 | .07 | 8.9 | 9.1 |
| P11 | 999 FPM | 1004 FPM | 09 | .06 | .07 | .07 | 9,2 | 9.5 |
| P12 | 996 FPM | 998 FPM | .08 | .08 | .02 | .05 | 8.3 | 9.1 |
| P13 | 351 FPM | 355 FPM | .07 | .07 | .06 | .07 | 9.5 | 7.6 |
| P14 | 347 FPM | 351 FPM | .04 | .09 | .07 | .05 | 8.2 | 8.5 |
| S01 | 489FPM | 439FPM | .08 | .08 | .07 | .09 | 9.2 | 9.9 |
| S02 | 499 FPM | 504 FPM | .09 | .06 | .09 | .08 | 9.2 | 10.0 |
| SO3 | 497 FPM | 499 FPM | .07 | .09 | .05 | .04 | 5.3 | 8.2 |
| S04 | 498 FPM | 502 FPM | .07 | .09 | .09 | .08 | 8.2 | 9.1 |
| V01 | 501 FPM | 505 FPM | .09 | .07 | .07 | .07 | 9.2 | 9.7 |
| V02 | 496 FPM | 498 FPM | .09 | .04 | .06 | .08 | 9.4 | 8.3 |
| #1 | **379 FPM** | 402 FPM | .09 | .10 | .11 | .09 | 13.1 | 11.2 |
| #2 | 389 FPM | 394 FPM | .09 | .09 | .09 | .07 | 11.0 | 9.9 |
| #3 | 390 FPM | 392 FPM | .10 | .09 | .09 | .07 | 9.3 | 10.0 |
| #4 | 393 FPM | 401 FPM | .09 | .07 | .08 | .06 | 9.2 | 8.9 |
| #5 | 401 FPM | 405 FPM | .08 | .08 | .09 | .06 | 8.7 | 9.3 |
| G01 | 343 FPM | 352 FPM | .09 | .06 | .07 | .07 | 8.3 | 9.2 |
| G02 | 351 FPM | 350 FPM | .07 | .09 | .08 | .08 | 8.9 | 9.1 |
| I01 | 493 FPM | 494 FPM | .09 | .08 | .05 | .09 | 9.4 | 9.2 |
| I02 | 492 FPM | 499 FPM | .08 | .07 | .07 | .09 | 9.1 | 8.8 |
| I03 | Out of | Service | | | | | | |
| I04 | 349 FPM | 351 FPM | .09 | .08 | .06 | .09 | 9.5 | 9.9 |
| I05 | 348 FPM | 347 FPM | .04 | .05 | .03 | .06 | 3.9 | 4.3 |
| I06 | 343 FPM | 348 FPM | .05 | .08 | .09 | .07 | 6.2 | 7.1 |
| I07 | 494 FPM | 499 FPM | .07 | .08 | .08 | .09 | 7.7 | 9.3 |
| I08 | 498 FPM | 497 FPM | .08 | .08 | .09 | .07 | 8.5 | 9.7 |
| I09 | 492 FPM | 501 FPM | .08 | .07 | .08 | .06 | 8.0 | 9.2 |
| I10 | 497 FPM | 501 FPM | .07 | .08 | .08 | .07 | 9.7 | 9.1 |
| E01 | 93 FPM | UP | | | | | | |
| E02 | DOWN | 97 FPM | | | | | | |
| E03 | 99 FPM | UP | | | | | | |
| E04 | DOWN | 92 FPM | | | | | | |
| E05 | 97 FPM | UP | | | | | | |
| E06 | DOWN | 93FPM | | | | | | |
| E07 | 89 FPM | UP | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| E08 | DOWN | 97 FPM | | | | | | |
| E09 | 93 FPM | UP | | | | | | |
| E10 | DOWN | 97 FPM | | | | | | |
| E11 | 94 FPM | UP | | | | | | |
| E12 | DOWN | 93 FPM | | | | | | |

## 16. Police Building

The six elevators were installed in the 1990's. Swift is no longer supported.

**Major Upgrade**

When modernizing use a firm that manufacturers and installs their own equipment. The major elevator providers/ installers will have field and corporate support for the installation and maintenance. The nonproprietary firms do not provide the field support that a major elevator manufacturers/ installers can provide. This would include Controllers, Machines, Door Equipment, Infrared 3 D Door Edges, Fixtures and Budget $200,000.00 per elevator or 1,200,000.00 for all six elevators.

**Additional upgrades:**

Rope Gripper is a safety device for elevators. It can protect an elevator unit from falling down by tightly gripping the suspension ropes when an emergency signal comes from the elevator controller. Any electrical or mechanical malfunction usually causes this signal. For example, an elevator may move beyond its speed limit or with its doors open. (Budget $30,000 to $45,000 per elevator and $180,000 to $270,000 for the bank of four high rise elevators depending on software required)

3D infrared door edges on the 6 Low Rise Elevators. The car door shall be provided with a new protective device that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact of the detector, which is capable of sensing an object approximately 6" into the corridor. The device shall provide this operation for a minimum of the lower two-third of the opening height. All protection devices that do not extend to the top of the car door shall have a blank extension that matches the door protection device face material from the top of the device to the top of the door panel. Budget $5,000.00 per elevator and $30,000 for all six elevators

**Summary current condition:**

- Machine room needs housekeeping
- Machine room door needs to be self closing locking
- Pits need housekeeping
- Safety tests are current
- Leveling speeds and jerk rates need adjustment
- Door equipment needs maintenance

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

## 17. ADA – Which is a Civil Rights Act that became effective on January 26, 1992

- 2 way emergency communication is installed on each elevator
- Infrared door edge protection
- Hoistway doors currently have escutcheons on all floors, which allow hoistway access to trained emergency and elevator personnel.
- The existing handrail meets ADA requirements
- Car operating Panel – Does meet ADA requirements
- Hall Push Button Stations are set at 42”centerline which meets ADA code.
- Car Direction Lantern needs to have directional chimes, 1 chime for up and two chimes for down.
- Braille Plates for Hatch door jambs should be installed at 60”, no jamb Braille
- Braille needs to be installed on the Car operating floor for door open button and first floor

**Meet ADA requirements – (The existing elevator meet all codes at the time of installation).**

**4.10.1** General. Accessible elevators shall be on an accessible route and shall comply with 4.10 and with the ASME A17.1-1990, Safety Code for Elevators and Escalators. Freight elevators shall not be considered as meeting the requirements of this section unless the only elevators provided are used as combination passenger and freight elevators for the public and employees.

**4.10.2** Automatic Operation. Elevator operation shall be automatic. Each car shall be equipped with a self-leveling feature that will automatically bring the car to floor landings within a tolerance of 1/2 in (13 mm) under rated loading to zero loading conditions. This self-leveling feature shall be automatic and independent of the operating device and shall correct the over travel or under travel**.**

**4.10.3** Hall Call Buttons. Call buttons in elevator lobbies and halls shall be centered at 42 in (1065 mm) above the floor. Such call buttons shall have visual signals to indicate when each call is registered and when each call is answered. Call buttons shall be a minimum of 3/4 in (19 mm) in the smallest dimension. The button designating the up direction shall be on top. Buttons shall be raised or flush. Objects mounted beneath hall call buttons shall not project into the elevator lobby more than 4 in (100 mm). :

**4.10.4** Hall Lanterns. A visible and audible signal shall be provided at each hoistway entrance to indicate which car is answering a call. Audible signals shall sound once for the up direction and twice for the down direction or shall have verbal annunciators that say "up" or "down." Visible signals shall have the following features:

(1) Hall lantern fixtures shall be mounted so that their centerline is at least 72 in (1830 mm) above the lobby floor.

(2) Visual elements shall be at least 2-1/2 in (64 mm) in the smallest dimension.

(3) Signals shall be visible from the vicinity of the hall call button. In-car lanterns located in cars, visible from the vicinity of hall call buttons, and conforming to the above requirements, shall be acceptable.

**4.10.5** Raised and Braille Characters on Hoistway Entrances. All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs. The centerline of the characters shall be 60 in (1525 mm) above finish floor. Such characters shall be 2 in (50 mm) high and shall comply with 4.30.4. Permanently applied plates are acceptable if they are permanently fixed to the jambs.

**4.10.6*** Door Protective and Reopening Device. Elevator doors shall open and close automatically. They shall be provided with a reopening device that will stop and reopen a car door and hoistway door automatically if the door becomes obstructed by an object or person. The device shall be capable of completing these operations without requiring contact for an obstruction passing through the opening at heights of 5 in and 29 in (125 mm and 735 mm) above finish floor . Door reopening devices shall remain effective for at least 20 seconds. After such an interval, doors may close in accordance with the requirements of ASME A17.1-1990. –

**4.10.7*** Door and Signal Timing for Hall Calls. The minimum acceptable time from notification that a car is answering a call until the doors of that car start to close shall be calculated from the following equation:

For cars with in-car lanterns, T begins when the lantern is visible from the vicinity of hall call buttons and an audible signal is sounded. The minimum acceptable notification time shall be 5 seconds.

**4.10.8** Door Delay for Car Calls. The minimum time for elevator doors to remain fully open in response to a car call shall be 3 seconds.

**4.10.9** Floor Plan of Elevator Cars. The floor area of elevator cars shall provide space for wheelchair users to enter the car, maneuver within reach of controls, and exit from the car.

The clearance between the car platform sill and the edge of any hoistway landing shall be no greater than 1-1/4 in (32 mm).

**4.10.10** Floor Surfaces. Floor surfaces shall comply with 4.5.

**4.10.11** Illumination Levels. The level of illumination at the car controls, platform, and car threshold and landing sill shall be at least 5 footcandles (53.8 lux).

**4.10.12*** Car Controls. Elevator control panels shall have the following features:

(1) Buttons. All control buttons shall be at least 3/4 in (19 mm) in their smallest dimension. They shall be raised or flush.

(2) Tactile, Braille, and Visual Control Indicators. All control buttons shall be designated by Braille and by raised standard alphabet characters for letters, arabic characters for numerals, or standard symbols, and

as required in ASME A17.1-1990. Raised and Braille characters and symbols shall comply with 4.30. The call button for the main entry floor shall be designated by a raised star at the left of the floor designation. All raised designations for control buttons shall be placed immediately to the left of the button to which they apply. Applied plates, permanently attached, are an acceptable means to provide raised control designations. Floor buttons shall be provided with visual indicators to show when each call is registered. The visual indicators shall be extinguished when each call is answered.

(3) Height. All floor buttons shall be no higher than 54 in (1370 mm) above the finish floor for side approach and 48 in (1220 mm) for front approach. Emergency controls, including the emergency alarm and emergency stop, shall be grouped at the bottom of the panel and shall have their centerlines no less than 35 in (890 mm) above the finish floor.

(4) Location. Controls shall be located on a front wall if cars have center opening doors, and at the side wall or at the front wall next to the door if cars have side opening doors.

**4.10.13*** Car Position Indicators. In elevator cars, a visual car position indicator shall be provided above the car control panel or over the door to show the position of the elevator in the hoistway. As the car passes or stops at a floor served by the elevators, the corresponding numerals shall illuminate, and an audible signal shall sound. Numerals shall be a minimum of 1/2 in (13 mm) high. The audible signal shall be no less than 20 decibels with a frequency no higher than 1500 Hz. An automatic verbal announcement of the floor number at which a car stops or which a car passes may be substituted for the audible signal.

**4.10.14*** Emergency Communications. If provided, emergency two-way communication systems between the elevator and a point outside the hoistway shall comply with ASME A17.1-1990. The highest operable part of a two-way communication system shall be a maximum of 48 in (1220 mm) from the floor of the car. It shall be identified by a raised symbol and lettering complying with 4.30 and located adjacent to the device. If the system uses a handset then the length of the cord from the panel to the handset shall be at least 29 in (735 mm). If the system is located in a closed compartment the compartment door hardware shall conform to 4.27, Controls and Operating Mechanisms. The emergency intercommunication system shall not require voice communication.

**Performance Spreadsheet**

| Elevator Number | Up FPM | Down FPM | Accel Up | Accel Dn | Decel Up | Decel Dn | Jerk Up | Jerk Dn |
|---|---|---|---|---|---|---|---|---|
| Elevator 1 | 343 FPM | 342 FPM | .08 | .09 | .08 | .08 | 8.2 | 9.9 |
| Elevator 2 | 349 FPM | 351 FPM | .08 | .07 | .09 | .09 | 10.2 | 10.7 |
| Elevator 3 | 352 FPM | 349 FPM | .09 | .08 | .09 | .07 | 4.5 | 8.8 |
| Elevator 4 | 354 FPM | 349 FPM | .07 | .09 | .08 | .08 | 6.7 | 11.3 |
| Elevator 5 | 352 FPM | 348 FPM | .08 | .09 | .08 | .06 | 8.2 | 9.7 |
| Elevator 6 | 353 FPM | 357 FPM | .07 | .08 | .08 | .09 | 9.9 | 10.2 |

The elevators need maintenance, leveling and jerk adjustment, maintenance to the door equipment and housekeeping.

# Appendix J
# Facility Condition Assessment

# Appendix J
# Section 1 – Site Civil

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

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# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

# Appendix J
# Section 2 – Atrium

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

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R.C. Section
149.433(B)(2)

R.C. Section
149.433(B)(1) -
Security Record

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Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

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# R.C. Section 149.433(B)(2) - Infrastructure Record

# Appendix J
# Section 3 – Courts Tower

# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

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Section 149.433(B)(2) - Infrastructure Record

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# R.C. Section 149.433(B)(2) - Infrastructure Record

# R.C. Section 149.433(B)(2) - Infrastructure Record

# Appendix J
# Section 4 – Jail I

# R.C. Section 149.433(B)(2) - Infrastructure Record & R.C. 149.433(B)(1) Securitity Records

# R.C. Section 149.433(B)(2) - Infrastructure Record & R.C. 149.433(B)(1) Securitity Records

# R.C. Section 149.433(B)(2) - Infrastructure Record & R.C. 149.433(B)(1) Securitity Records

# R.C. Section 149.433(B)(2) - Infrastructure Record & R.C. 149.433(B)(1) Securitity Records

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# Appendix J
# Section 5 – Jail II

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# Appendix J
# Section 6 – Police Building

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# Appendix K
# Top Issues List

# "TOP Issues"

In anticipation of the significant expenditure required to renovate the Justice Center Complex, Cuyahoga County requested preparation of a "Top Issues List" of recommended repairs / maintenance for the Justice Center Complex. We have based our Top Issues recommendation list on urgent repair need without consideration of budget constraints.

For the purposes of this section, the following maintenance definitions will be used:

- Routine Maintenance: funded through the annual operating budget: maintenance needed to preserve the facilities and system components from failure or deterioration. Routine maintenance is largely provided by onsite staff or on-call vendors.
- Major Maintenance: primarily funded through County / City maintenance reserves, repair and renewal reserves (only in auxiliary units currently), or capital outlay projects. Consists of major repairs of maintenance deficiencies that can be accomplished without major disruption to occupants and systems, generally cost is less than $1 million.
- Building Renewal: primarily funded through capital outlay projects, County/City maintenance reserve funds, or repair and renewal reserves (only in auxiliary units currently), can address maintenance deficiencies. However, these differ from major maintenance as they typically focus on larger systems renewal, ADA compliance, building code compliance, life safety improvements, and environmental compliance.

The Assessment Team also prepared the following thoughts relative to the work that should occur in FY2014. The approach taken was to resolve core life safety issues that will not otherwise be addressed with the interior building modifications (programmatic changes), to address key maintenance issues that exacerbate degradation on the building interior, and resolve critical challenges to the secure nature of the building. The following twelve (12) items could be addressed:

1. Atrium Smoke Control: Atrium lacks a smoke removal system. Ohio Building Code (OBC) 2011-404.5 requires a smoke control system designed per OBC-909 since the Atrium connects more than two stories. Install a smoke control system to improve the life safety aspects of the building.
2. Fire Dampers: Option A is to do the main trunks that would likely stay in place even in a system replacement and Option B is to find them all and test.
3. All Parking Garages: Carbon monoxide sensors do not function properly and the ventilation system is typically turned off manually. Repair or replace sensors so they function as intended. Replace existing heating & ventilating units serving the Corrections Garage.
4. Exit signage: The work includes resolving inadequate signage and resolving signage pointing in the wrong direction throughout the justice center complex. The information below represents 50 new signs will be required and 20 signs will need to be replaced. All signs are estimated as L.E.D. standard, double face, ceiling or wall mounted units.
5. Keying: Institute a key management system that is physically checked against each lock. This should resolve potential for security breach, ensure access to doors by appropriate parties, and adequately allow exiting in an emergency. It is highly likely that some locks / cylinders will need to be replaced, key storage boxes installed, and multiple keys created. A Door Hardware Consultant should be hired to assist the County in developing a proper management system.

6. Fire Protection – Jail I: Unprotected floor to floor stairs in Jail(s) compromise the fire rating. Stairs should be enclosed or smoke barriers and water curtains installed.
7. Fire Protection: The compactor room being installed in the Corrections Center (Jail I) building should have a sprinkler system run to this space given its anticipated use. While this is not required by the building code we do believe it is prudent given the potential of fire.
8. $4^{th}$ Floor Windows: For the original Justice Center buildings (Courts, Atrium, and Corrections Center) we recommend replacing the glazing, frames, head flashing, and all sealant at the $4^{th}$ Floor only. We are limiting this work to the $4^{th}$ floor given the potential FY14 budget and understanding these windows need to be replaced immediately. A benefit to performing this limited work is the ability to refine the technique for replacing windows in advance of the future Justice Center –wide exterior window replacement projects required within the next (5) years.
9. Courts Tower Sealant Replacement: All of the exterior sealant applications at the Justice Center are past their useful life and are failing. We recommend replacing all building sealants including sealant at wall panels, louvers, windows, curtain wall, doors, and building envelope penetrations
10. Courts Tower Wall Panel Sealer: There are current stone spalls and cracks that require repairs at this time. There are also granite panels that are exhibiting cupping or warping that requires repairs. Once the repairs are complete and the granite is washed to remove the built up environmental contaminants and dirt, a clear stone water repellent should be applied to delay further warping of the granite panels. Note: when the windows are replaced we recommend a re-application.
11. ADA Parking: In total there are (24) accessible parking spaces located in the county owned parking garages at the Justice Center. We recommend these spaces only be used by County employees. New accommodations for public parking should be created at the plaza level on Ontario given its proximity to the "most accessible" building entrance point. Twelve (12) additional spaces should be provided. Modification to the sidewalk (curbing and pavement) and structure over the underground parking area (waterproofing, landscape, and structure) will be required. The cost estimate to perform this work is similar to those anticipated for "structured" parking given the fact that work is not on grade.
12. Perimeter Security: The first component includes the Installation of two pre-assembled security buildings at the garage entrances on Lakeside and West $3^{rd}$ Street. A drop gate should be installed on the entrance lane at each building location. The guards who are located inside the parking area will be stationed in these buildings (a procedure will need developed for relieving the guards). The second component requires modifying the exterior sidewalk and closing the street lane on W3rd Street to create a staging area for contractors and deliveries. This enables vehicle inspection to occur prior to them entering the building and limits the need for non-employee vehicles and people to enter the secure garage. Lastly we recommend two new 36-inch+ magnetometers (walk thru metal detectors) replacing the existing 30-inch units at the two entrances to the Justice Center. The new units provide a greater level of scanning and are ADA compliant.

**Summary**

The list parallels the nine (9) systems that were analyzed as part of the facility condition assessment. The items listed below are essential functions that must be maintained by the County and City to prolong the useful life of the Justice Center and maintain acceptable conditions for occupant use. The following items below represent top priorities for each individual discipline for reference by the County and City. Each item should be considered a priority with respect to the building system they represent. The spreadsheet prepared represents these findings as well as the prepared narrative.

**Site / Civil**

1. The plaza west of the Police Headquarters, east of Jail 2 and south of the Atrium is in serious disrepair with loose tiles, pavers and crumbling concrete. There is access to the west plaza from Jail 2 as well as from the 2nd floor of Jail 1. In an event of an emergency, exiting to the plaza in its present condition is not acceptable. We have assumed this exit and area is for emergency egress therefore should be repaired. After leaving the building in an emergency situation it is very difficult for persons to access the street; this should also be addressed during repairs.
2. The perimeter sidewalks have moderate to severe surface damage, mostly from de-icing salts. Large portions have been marked and appear to be scheduled for repair in the near future.
3. The main plaza over the police and court tower parking areas appears to be in fair condition with moderate paver heaving and minor paver cracking in localized areas. These areas should be repaired as soon as possible to avoid pedestrian injuries and leakage into the parking areas below.
4. The north entrance main stairway is in good condition with minor localized cracking. This area should be closely monitored for surface damage, cracking, and leakage into the court tower parking areas below.
5. The driveways leading from West 3rd Street into the main loading dock, sally port, and Sheriff's parking area all show extensive and severe surface damage, mostly from de-icing salts. These areas should be repaired as soon as possible to avoid pedestrian injuries, vehicle damage, and leakage into the parking areas below.

**Building Façade / Roof**

Overall, the conditions of the facades and roofs do not lend themselves to piecemeal repairs due to the size of the scope, and the cost prohibitive nature of multiple staging requirements necessary to access the buildings. All sealant joints throughout the Justice Center Complex are failed and need to be replaced; replacement should be a top priority given the function of the sealant joints.

The identified life safety concerns in the Court Tower and the Police Headquarters should be scheduled for immediate repair. The County and the Police were notified of the conditions and we understand repairs are being scheduled internally, independent of this analysis.

Façade:

1. Court Tower: Repair all damaged wall panels. This is the top priority due to overall condition and specific life safety concerns including repairs of the wall panel attachment details.
2. Court Tower: Replace all sealants. There is widespread water infiltration caused by the failed sealant joints throughout.
3. Court Tower: Install flashings at all windows. The flush mounted windows contribute to water infiltration due to a lack of flashings.

4. Police Headquarters: All sealants have failed and should be replaced. This building is in poor condition as a result of prolonged deferred maintenance. There are life safety concerns associated with the wall panel attachment details. Water infiltration issues are prevalent.
5. Jail II: All sealants have failed and should be replaced. Cracked and spalled façade panels have been identified, in addition to water infiltration resulting in biological growth visible at window locations.
6. Jail I: Replace sealants. All sealants have failed. Water infiltration was noted in multiple locations.

Roof:

1. Police Headquarters: Replace existing roof. Verified wet roof through IR scanning and core cuts; reported roof leaks.
2. Jail II: Replace roof membrane and all associated flashings. Verified wet roof with core cuts. No reported roof leaks.

**Building Interiors**

1. Replace existing worn floor finishes that are vinyl tile or carpet. They are well past their useful life and create tripping hazards and/or are non-ADA compliant
2. Bring Justice Center and CPMH up to ADA compliance by building systems that conform to ADA compliance codes (i.e. doors, hardware, ramps, stairs, site, elevators, bathrooms, etc.). It is recommended that the County review its standards for accessibility compare it to the ANSI 117.1.
3. Replace ceiling finishes throughout the CPMH facility once the HVAC systems are replaced in their entirety.
4. Replace the interior finishes in the courtrooms and employ modern acoustics, technology, and accessibility provisions.
5. Refinish walls, doors, ceilings, and floors (where applicable) in the jail. Reinstitute the program in the jail using inmates to complete this work as vocational training. Have current on-site union trades supervise the work.
6. Replace the washer, dryer, and compactor(s) that are not functioning in the basement of Jail II.
7. Jail II - Make repairs or modification as technically feasible. Stairwells do not meet most current codes, including tread nosing, area of refuge, and others. Fireman jack is blocked by fire riser in corner.
8. Conduct operability maintenance on all paths of egress doors throughout Jail I and Jail II. There are several doors that do not operate as intended. Make all doors operational as required by code.
9. Keying coordination to provide access throughout the Jail facility. Institute a key management system that is physically checked against each lock, ensure that master keys are available and function properly, and adequately allow exiting in an emergency. Unable to determine if there was an emergency keying ring that should be available by floor. Need to commission the security system (door, lock, access control, intercom, and camera).
10. Exit signage is inadequate or pointing in the wrong direction throughout the entire justice center complex.

**Mechanical / Plumbing**

1. Atrium Smoke Control. Atrium lacks a smoke removal system. OBC 2011-404.5 requires a smoke control system designed per OBC-909 since the Atrium connects more than two stories. Recommend installing a smoke control system to improve the life of the building.
2. CMPH Corridor Serving as a Return Air Plenum. Recommend reworking return air ductwork so that all air is pulled from the existing ceiling plenum instead of the corridor. A portion of the return air is pulled from the ceiling plenum while the remainder is pulled through return air grilles installed in the corridor walls. Consequently, the corridor becomes a return air plenum. Ohio Mechanical Code OMC-601.2 prohibits corridors from being used as a return air plenum.
3. CMPH Stair Pressurization. Recommend the installation of a stair pressurization system. There does not appear to be a stair pressurization system in this building. Per OBC-403.5.4 every required exit stairway serving floors more than 75 feet above the lowest level of fire department vehicle access shall comply with OBC-909.20 and 1022.9. OBC-1022.9 requires a smoke proof enclosure or a pressurized stair.
4. Court Tower Engineered Smoke Control Systems. . Establish a plan for routine maintenance and repairs based on testing results. Non-dedicated systems including smoke dampers should be tested annually per OFC and NFPA. Recommend conducting a test of all smoke dampers to confirm operability.
5. Court Tower Stair Pressurization Systems. Establish a plan for routine maintenance and repairs based on testing results. These systems should be tested annually per OFC and NFPA. Recommend inspecting and testing the stair pressurization system to confirm operability.
6. All Buildings Fire Dampers. Establish a plan for routine maintenance and repairs based on testing results. Systems should be tested every four years per OFC and NFPA. Recommend inspecting and testing the fire damper system to confirm operability.
7. Court Tower Parking Garage. Recommend calibration or replacement of CO sensors and associated controls as well as testing / commissioning of the system to verify proper operation. Carbon monoxide CO sensors do not function properly and the ventilation system is typically turned off manually.
8. CMPH HVAC & Control. Recommend replacement of the entire existing system either component by component or comprehensively as part of a larger modernization project. The air handlers and air distribution systems are generally well past their expected service life and do not appear adequate in capacity or configuration to meet the ventilation and comfort needs for the current usage. The air distribution is controlled by a bladder style air valve which is antiquated and not energy efficient. The HVAC system lacks any type of functioning automatic control; nearly everything is manually controlled and adjusted.
9. Court Tower, Atrium, Jail I HVAC & Control. Recommend replacement of the entire existing system either component by component or comprehensively as part of a larger modernization project. The air handlers and air distribution systems are generally well past their expected service-life and do not appear adequate in capacity or configuration to meet the ventilation and comfort needs for the current usage. HVAC controllers and pneumatics are antiquated and need to be replaced.
10. Court Tower, Atrium, Jail I and CMPH. Recommend creating and implementing a plan to repair or replace 25% of the HVAC and plumbing piping items throughout the Justice Center, each year for the next four years until the entire system is replaced. The HVAC and plumbing piping have

several issues including: malfunction of isolation valves, significant mineral deposits in portions of the domestic cold water lines, chilled water branch piping to air handlers is corroding internally from the outside, ; original cast iron sanitary and rain leaders are fatiguing, cracking and failing in many places, and the remainder of the piping is approaching its useful service life.

**Structural**

1. Jail 2 basement (in conjunction with Jail Kitchen renovations - currently in progress):
   a. Address water below slab to allow construction of freezer and cooler recessed slabs (grout injection).
   b. Address water-free space below freezer recessed slab (design concepts now being developed).
2. Clean floor drains, snake underground piping, and test flow at CP Parking Level P2. Replace systems as needed to function as originally intended.
3. Repair or replace the concrete beam above main door in Court Tower Parking Level P2 along Line H between Columns 12 and 13.
4. Repair or replace the concrete slab and waterproofing at Jail 1 sally port where it currently leaks thru to Sheriff's Parking on Level P2.
5. Replace spray-on fire proofing applied to structural steel. Lack of fire proofing was noted in areas where the structure was visible, such as in the mechanical rooms.

**Electrical**

1. Proper Housekeeping - critically important around substations and in electrical closets
   a. Electrical closets in all buildings - found trash and abandoned IT wire, racks, and devices
2. Fire Alarm System in Police Headquarters - the existing system does not function properly and it needs to be completely replaced.
3. Many branch circuit breaker panelboards in Police Headquarters should be replaced. They are in a state of disrepair with doors that will not close properly and missing breakers.
4. Lighting in the Police Headquarters needs to be replaced with modern more efficient lighting fixtures. Existing lighting controls cover only part of the building and need to be expanded to cover the entire building to increase energy savings.
5. Routine Maintenance -
   a. Substations need to have breakers exercised and calibrated
   b. Substation have dust clogged vents and need to be cleaned
   c. Transformers should be tested every three years.
6. Start planning for replacement of major equipment
   a. Police Headquarters unit substation is near end of useful life
   b. Court Tower and Jail I substations are near end of useful life
7. System One-Line diagrams should be posted at all substations to aid in safe restoration of service during maintenance and emergencies.

**Technology**

1. Provide UPS systems for all network electronics, minimally to include all Voice over IP network electronics.

2. Provide emergency power for all Telecommunication rooms, closets, and spaces to feed the UPS systems listed above.
3. Provide grounding for all Telecommunication rooms, closets, and spaces.
4. Provide cooling for all Telecommunication rooms, closets, and spaces.
5. Provide physical separation between all HVAC and electrical equipment in all Telecommunication rooms, closets, and spaces.
6. Expand the footprint of the County's "Main Core" room to handle future growth.
    a. Provide emergency power and UPS.
    b. Provide better HVAC.
7. Provide physical separation between County's "Main Core" room and existing AT&T demarc room.
8. Provide new Category 6 UTP cabling for all courtrooms to support new integrated Audio Visual conferencing.
9. Provide additional fiber cabling infrastructure and new active network electronics to support the migration of all video surveillance cameras going to IP as well as new integrated Audio Visual Conferencing.
10. Finish conversion of remaining phones to Voice over IP.

**<u>Security</u>**

1. Security enhancements including improvements in perimeter security, revised weapons screening, and enhanced restrictions, and surveillance of restricted circulation
2. Vulnerability to improper access to sensitive areas
    a. Inadequate and poor use of CCTV
    b. Inadequate use of intercom
    c. Inadequate and circumvention of access control
3. Inadequate Portal Security
    a. Too few screening lanes
    b. Too few screening staff
    c. Very limited screening of staff
    d. Screening equipment upgrades
4. Inadequate physical and electronic security in the courtrooms
    a. Courtrooms unlocked
    b. Access to Judges corridor compromised
    c. No physical protection within courtrooms
5. No Uniform Security Policy among using agencies
    a. Each entity has its own escort and weapons policy
6. Outdated and inadequate use of CCTV
    a. Very limited use of IP CCTV
    b. Analog CCTV is very close to obsolescence
    c. No integration or use of CCTV analytics
7. Need to limit inmate movement
    a. Possible use of video visitation
    b. Enhanced use of video arraignment
    c. Consider discontinuing the use of connecting stairs.
8. Inadequate physical security at spaces converted for inmate housing

   a. Analyze physical assault of existing barriers
   b. Consider hardening options for barrier enhancement/replacement

9. Inadequate duress system
   a. In court building system expansion and integration
   b. In Jails
10. Significant systems obsolescence
    a. In Jail 1 locking controls have very little central reporting and control –panels are obsolete manual controls
    b. In Jail 2 locking controls include obsolete manual switch panels which limit operator control
    c. Analog CCTV cameras and system components
    d. The limited IP CCTV (primarily Courts Tower) should be integrated with access control and other systems (duress etc.)
    e. Jail 2 Mitsubishi Programmable Logic controller is obsolete although still serviceable
    f. Combo use of Fire Alarm for locking control and monitoring in Jail 1 and Jail 2 limits interoperability
    g. Older disparate systems cannot take advantage of system integration
    h. Old style Folger 120 series locks, 400 series locks, and 900 series locks have long since been obsoleted by the manufacturer although service options still exist for some
11. Force Protection measures almost non-existent
    a. Facility structural access by unauthorized vehicles
    b. Access to under building parking and loading docks
    c. Very little “safe zone” at street level
    d. No safety reinforcement of building envelope elements

**Fire Suppression**

1. Water Supply Justice Center: Per NFPA 20 Section 6.3.2 (5) a pipeline strainer is recommended on the suction side of the backflows feeding the fire protection systems and fire pumps. This is not a requirement, but has been found necessary in Cleveland because of the age of the underground mains and the amount of debris in those lines. Cleveland Fire Prevention requires a strainer on all new pump installations because of this issue.
2. Water Supply Jail 2: Per NFPA 20 Section 6.3.2 (5) a pipeline strainer is recommended on the suction side of the backflows feeding the fire protection systems and fire pumps. This is not a requirement, but has been found necessary in Cleveland because of the age of the underground mains and the amount of debris in those lines. Cleveland Fire Prevention requires a strainer on all new pump installations because of this issue.
3. Standpipes – All Buildings: All floors where the static pressure in the standpipe system exceeds 175 psi must have pressure reducers or pressure restriction devices installed at the 2 ½” Fire Department Valves (FDVs) per NFPA 14 Section 7.2.3.2 (this will probably be all FDVs on and below the 3rd floor including the garage).
4. Standpipes – All Buildings: The Pressure reducing, regulating or restricting devices must be tested annually per NFPA 25 Table 6.1.1.2 and Table 13.1.1.2. This will require flowing water through the (FDVs). A drain system (3” pipe) from the valves to garage level will be required to perform this test.

5. Dry sprinkler valves: The dry valves should have low air pressure switches. This is not a code requirement; however, it is good practice. A low air alarm will greatly decrease the chances of an accidental trip of the system due to air leakage or compressor failure and the chance of the system getting damaged due to freezing.
6. New compactor room does not have sprinklers. This room has a very high hazard for fires and should be protected.
7. Unprotected floor to floor stairs in Jail(s) compromise the fire rating in the building; stairs should be enclosed or smoke barriers and water curtains installed.
8. Standpipes need to be flow and hydrostatically tested.
9. All existing 1 ½" fire hoses must either be tested or removed (upon written approval of the Cleveland Fire Department) per NFPA 25 Section 7.1.4 and Cleveland Fire Prevention Ruling.
10. Sprinkler system test reports and testing required for quarterly and annual tests per NFPA requirements.

# Appendix L
# Lifecycle Cost Analysis

## Summary

As part of the facility assessment, a separate lifecycle cost analysis was performed for the Court Tower/Atrium complex, Jail I, Jail II and the Police Building. Energy models of each building were created using construction drawings and information obtained during the assessment and the models were calibrated to match the buildings' actual energy consumption. Opportunities for energy reduction were identified and modeled to determine the energy cost savings. Detailed cost estimates were performed for each energy conservation measure (ECM) to determine the cost of implementation. The simple payback of each ECM was calculated to determine which ECMs should be recommended. Refer to the table below for a summary of the 29 ECMs identified.

| Building | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | | | | Metrics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
| | | $ | kWh | klbs | ton hours | MMBtu | $ | $ | Years | Years | Years |
| Jail I | Occupancy Sensors | $60,779 | 591,016 | 60 | 82,450 | 3,078 | $72,409 | $0 | 20 | 0.8 | 0.8 |
| Police | Occupancy Sensors | $107,855 | 906,517 | -385 | 88,750 | 3,698 | $86,697 | $0 | 20 | 1.2 | 1.1 |
| Court Tower | Occupancy Sensors | $145,311 | 358,149 | -4 | 44,967 | 1,757 | $41,164 | $0 | 20 | 3.5 | 1.6 |
| Court Tower | Variable Primary Pumps | $733,616 | 1,599,073 | 0 | 0 | 5,456 | $111,935 | $50,000 | 30 | 4.5 | 2.9 |
| Police | LED Lighting Upgrade | $1,291,280 | 1,219,172 | -181 | 172,492 | 6,014 | $143,345 | $133,109 | 20 | 4.7 | 3.7 |
| Jail I | Garage Heat Recovery & CO2 | $475,952 | 121,649 | 3,814 | 0 | 4,969 | $94,759 | $0 | 30 | 5.0 | 3.8 |
| Jail I | Variable Primary Pumps | $490,991 | 765,268 | 0 | 0 | 2,611 | $53,569 | $30,000 | 30 | 5.9 | 4.0 |
| Jail II | Occupancy Sensors | $51,923 | 99,188 | -86 | 9,333 | 347 | $8,351 | $0 | 20 | 6.2 | 4.1 |
| Jail I | LED Lighting Upgrade | $1,760,589 | 1,195,120 | -99 | 189,492 | 6,233 | $149,635 | $120,200 | 20 | 6.5 | 4.7 |
| Court Tower | Garage LED Lighting | $188,541 | 168,057 | 0 | 0 | 573 | $11,764 | $13,840 | 20 | 7.4 | 4.7 |
| Jail I | Garage LED Lighting | $75,083 | 66,926 | 0 | 0 | 228 | $4,685 | $5,512 | 20 | 7.4 | 4.8 |
| Police | Façade Maintenance | $352,648 | 6,020 | 1,951 | 8,242 | 2,449 | $47,497 | $0 | 40 | 7.4 | 4.9 |
| Court Tower | LED Lighting Upgrade | $2,019,997 | 595,427 | 537 | 143,808 | 4,398 | $105,593 | $139,881 | 20 | 8.2 | 5.4 |
| Police | Variable Speed Pumps | $365,462 | 446,325 | 0 | 0 | 1,523 | $31,243 | $10,000 | 30 | 8.9 | 5.5 |
| Jail II | LED Lighting Upgrade | $547,170 | 367,266 | -476 | 38,767 | 1,150 | $28,897 | $23,460 | 20 | 10.5 | 5.7 |
| Jail I | Façade Maintenance | $636,435 | 69,080 | 2,197 | -3,250 | 2,820 | $53,332 | $0 | 40 | 11.9 | 5.9 |
| Police | VAV with Advanced Controls | $3,565,081 | 807,637 | 2,317 | 387,292 | 10,170 | $248,345 | $30,000 | 30 | 12.8 | 7.0 |
| Police | Garage LED Lighting | $126,104 | 84,201 | -94 | 0 | 175 | $3,768 | $4,547 | 20 | 15.2 | 7.0 |
| Court Tower | VAV with Advanced Controls | $13,812,502 | 2,739,128 | 6,802 | 882,908 | 28,063 | $663,389 | $220,000 | 30 | 15.6 | 9.8 |
| Jail II | VAV with Advanced Controls | $3,790,099 | 986,794 | 4,710 | -75,617 | 8,083 | $148,336 | $80,000 | 30 | 16.6 | 10.3 |
| Jail II | Variable Speed Pumps | $280,293 | 237,335 | 0 | 0 | 810 | $16,613 | $0 | 30 | 16.9 | 10.3 |
| Court Tower | Daylight Harvesting | $761,211 | 270,509 | 162 | 61,458 | 1,854 | $44,730 | $0 | 20 | 17.0 | 10.4 |
| Jail I | VAV with Advanced Controls | $7,040,204 | 1,385,672 | 4,787 | 257,383 | 13,532 | $297,891 | $50,000 | 30 | 20.2 | 11.4 |
| Court Tower | Façade Maintenance | $685,462 | -15,192 | 1,108 | -15,283 | 1,088 | $18,487 | $0 | 40 | 37.1 | 11.6 |
| Court Tower | Window Upgrade | $12,684,627 | 553,384 | 6,953 | 261,675 | 13,330 | $290,151 | $0 | 30 | 43.7 | 14.1 |
| Jail II | Roof Replacement | $398,199 | 2,706 | 52 | 1,417 | 88 | $1,872 | $0 | 40 | 212.8 | 14.2 |
| Jail I | Roof Replacement | $799,465 | -13,152 | 105 | 942 | 91 | $1,782 | $0 | 40 | 448.7 | 14.4 |
| Police | Roof Replacement | $591,627 | -1,096 | 44 | 900 | 59 | $1,232 | $0 | 40 | 480.2 | 14.6 |
| Court Tower | Roof Replacement | $2,081,972 | 1,700 | 74 | 575 | 101 | $1,992 | $0 | 40 | 1045.0 | 15.1 |
| **Total** | | **$55,920,476** | **15,613,879** | **34,346** | **2,538,700** | **124,748** | **$2,783,464** | **$910,550** | **29.7** | **15.1** | |

(1) Does not include cost of replacing existing HVAC system with the same equipment in five years.

The roof replacements for all four buildings have a long payback, greater than 200 years. Replacing the roofs is not recommended solely for energy savings since the payback is so long, but the roofs should be replaced when necessary due to their condition. With the exception of expensive upgrades to the Court Tower's windows and facade, the rest of the ECMs can be implemented within a 20 year simple payback period. The envelope and lighting ECMs should be implemented before or concurrently with the HVAC ECMs in order to reduce the size and installation costs of the new HVAC systems.

Upgrading the water closets, urinals, and lavatories to low flow was also assessed for the Court Tower, Atrium and Police buildings. These water conservation measures resulted in an annual utility and maintenance cost savings of $459,428 with a simple payback of 19.2 years.

| Building | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | Metrics | |
|---|---|---|---|---|---|---|
| | | Water / Sewer (mcf) | Water / Sewer Cost Savings | Maintenance Cost Savings | Expected Useful Life | Simple Payback Period (SPP) |
| Court Tower | $841,956 | 238 | $21,275 | $10,741 | 30 | 26.3 |
| Atrium | $33,618 | 28 | $2,515 | $406 | 30 | 11.5 |
| Police | $265,550 | 238 | $21,208 | $3,283 | 30 | 10.8 |
| **Total** | **$1,141,124** | **504** | **$44,998** | **$14,430** | **30** | **19.2** |

After the simple payback of each energy and water conservation measure was evaluated, the lifecycle cost of each existing building was compared to the lifecycle cost of each building with all ECMs implemented over a time period of 20 years. The lifecycle cost analysis includes inflation of equipment, maintenance, and utility costs to provide a more realistic picture of the costs associated with operating the buildings and implementing the ECMs over the course of 20 years.

If all 29 ECMs and 9 water conservation measures are implemented, the buildings can save **$36,824,616 in lifecycle cost** over a time period of 20 years. Refer to the table below for a summary of the lifecycle cost analysis.

| Building | Existing Building Lifecycle Cost | Lifecycle Cost with all ECMs | Lifecycle Cost Difference | Percent Savings |
|---|---|---|---|---|
| Court Tower/Atrium | $45,712,476 | $37,573,791 | $8,138,685 | 17.8% |
| Jail I | $33,578,682 | $20,692,120 | $12,886,563 | 38.4% |
| Jail II | $18,189,946 | $13,552,869 | $4,637,077 | 25.5% |
| Police Building | $24,679,297 | $13,517,005 | $11,162,292 | 45.2% |
| **Total** | **$122,160,401** | **$85,335,785** | **$36,824,616** | **30.1%** |

The life cycle cost savings of implementing all 29 ECMs would be even greater if the building envelope upgrades were made in advance of the HVAC upgrades and if the lighting upgrades were performed concurrently with the HVAC upgrades. This is possible since the building envelope and lighting upgrades reduce the peak sensible cooling demand, which in turn reduces the first cost of the HVAC systems. Also, replacing ceiling, lights, HVAC air distribution and the addition of sprinklers should be performed concurrently in order to minimize disruption and first cost. This is particularly true since a one for one replacement of the lights, diffusers and VAV boxes does not adequately address comfort and energy efficiency.

Please note that the Court Tower / Atrium existing air handling capacity of 427,000 cfm is insufficient to meet the current building cooling needs. In order to meet the existing building cooling demands, the total system airflow needs to increase to 555,000 cfm, or 30% greater than the existing system size of 427,000 cfm. This is due to the increased occupancy and internal loads over the original design intent. If the system is converted to a complete VAV system, the total system airflow will only need to be 470,000 cfm since the airflow can be reduced due to diversity in thermal loads at the perimeter spaces facing different directions. If all of the energy conservation measures recommended in this Report are implemented, the total system size can be decreased even further to about 365,000 cfm, which is 17% less than the current system. A smaller system size, reduced number of air handling units, and less complicated system decreases the first cost of equipment and ductwork modifications substantially.

## METHODOLOGY

Our team utilized the Trane Trace 700 v6.4 energy simulation software based analysis to evaluate the energy savings potential of Building HVAC, Lighting and Envelope Upgrades. In order to estimate energy savings, the first step was to determine the facility's baseline energy consumption. The detailed utility analysis presented earlier in this Chapter established historical energy consumption and trends.

The baseline energy model was developed based upon data collected during our site visits, interviews with maintenance staff, and review of existing drawings and specifications. The baseline energy model was subsequently then compared to the utility analysis. Any discrepancies were identified, further investigations were conducted, and the baseline model was calibrated to reflect actual usage and operational characteristics. The baseline energy model serves as a reference point to compare the effect of proposed Energy Conservation Measures (ECMs), testing individual and combined effects on utility consumption and cost. ECMs are modifications made to the building envelope, lighting, and HVAC systems that improve the building's operation and reduce its energy consumption.

Potential energy savings opportunities were evaluated in a holistic manner leveraging synergies between various ECMs, assuring savings from multiple ECMs are appropriately modeled without "double counting" savings. The data generated by the simulation was used to evaluate the first cost, energy reduction, and payback of the recommended enhancements for the Justice Center complex.

The Court Tower, Atrium, and Jail I were first modeled together since they share the same utility meters. Once the model was calibrated to match the actual utility data, the model was split up between Court Tower/Atrium and Jail I. Jail I was separated from the Court Tower model since it has a significantly different operation. The Atrium was kept on the Court Tower model because the two buildings share many of the same HVAC systems making it difficult to model the HVAC energy conservation measures separately. Jail II and the Police Building were each modeled separately, for a total of four buildings.

Water savings was calculated using the same methodology as LEED prerequisite WEp1: Water Use Reduction. Typical daily utilization rates were assumed for each type of occupant to determine the savings for upgrading to more efficient fixtures.

Detailed cost estimates were performed for each energy and water conservation measure to determine the cost of implementation. Refer to Appendices D thru G for detailed cost estimates by building. The following parameters were used to determine ECM project costs:

- Labor Rate: $65 per hour, no overtime
- General Conditions: 10% markup
- Architectural Fees: 8% for A/E
- Contingency: 10% for construction

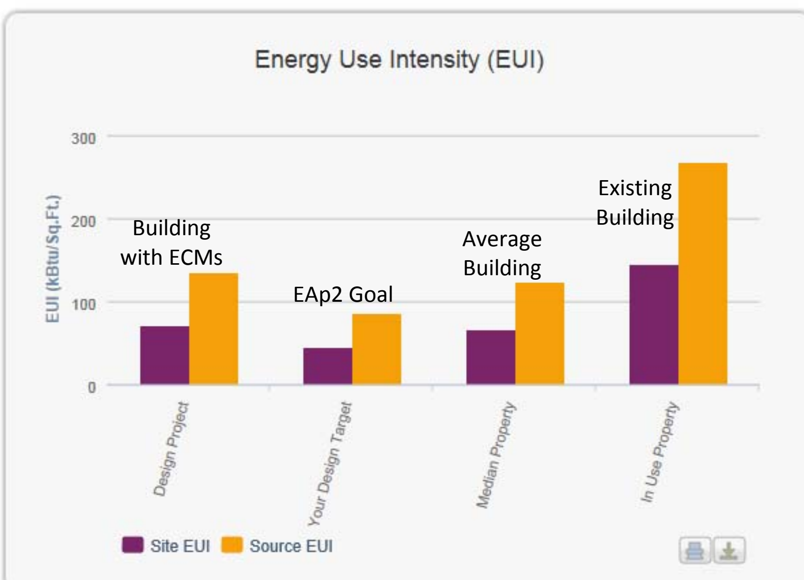
The cost to replace the existing equipment one-for-one in the existing building was estimated to be $30 per sf, which was incorporated into the lifecycle cost analysis at year 5. Ceiling replacement cost was not included in the cost estimates.

## ENERGY STAR BENCHMARKING

If LEED Existing Buildings Operation and Maintenance (EBOM) Certification was pursued, the buildings would need to achieve a minimum Energy Star score of 69 to meet mandatory Energy and Atmosphere Prerequisite 2 (EAp2): Minimum Energy Performance. If the buildings are not eligible for Energy Star rating due to their occupancy types, the buildings must use 19% less energy than average buildings of the same type in Energy Star Portfolio Manager. Refer to the Sustainability section for more information about LEED EBOM and Energy Star benchmarking.

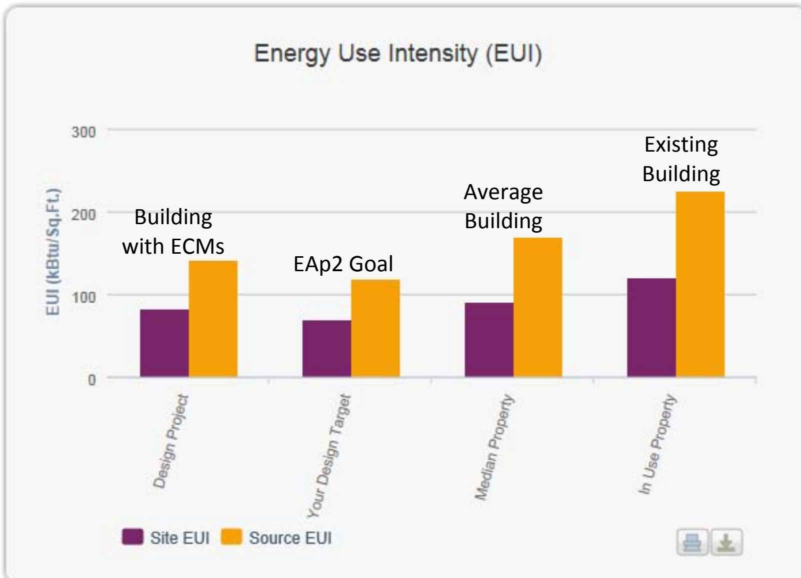
The Court Tower building alone would be eligible for an Energy Star rating, but the building currently shares the same utility meters with Jail I. Either Jail I would have to be included with the Court Tower, making the building ineligible for an Energy Star rating, or Jail I would need to be separately metered. If electricity, steam, and chilled water serving Jail I can be easily sub-metered, then we recommend separately metering the buildings. Not only will this facilitate LEED EBOM Certification, but it will also provide a better understanding of how energy is split between the buildings and how successful the implemented ECMs are. Jail II and the Police Building are not eligible for Energy Star rating at all due to their occupancy, but these buildings could still achieve EAp2 by demonstrating that they are 19% more efficient than average buildings of the same type.

The Court Tower and Jail I complex, as it exists now without any improvements, uses more than twice the energy of an average building with the same occupancy. With all of the recommended ECMs implemented, the building uses only 7% more energy than the average building. This is not enough to meet EAp2, but it is still a significant improvement. More energy conservation measures would need to be implemented to achieve the EAp2 goal. However, with sub-meters and a new building automation system, it will be much easier to track the buildings' performance and make operational adjustments to decrease the buildings' energy consumption over time.



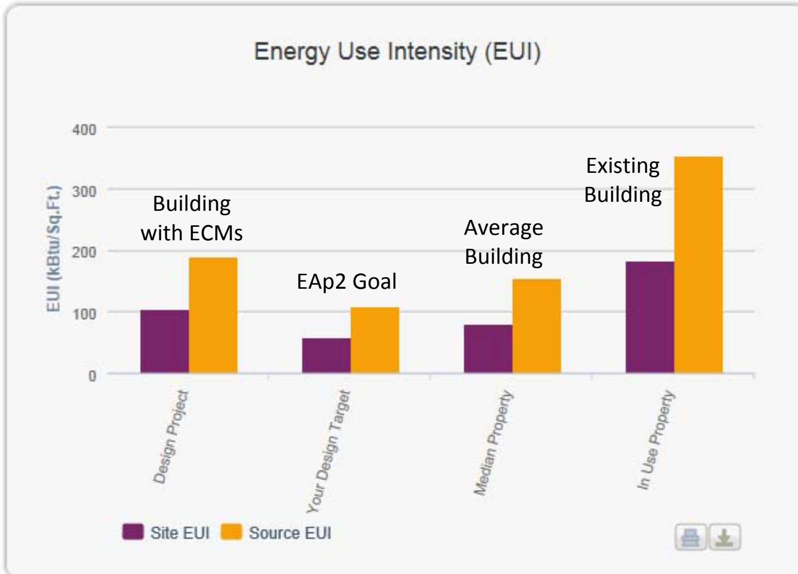

**Court Tower/Jail I Energy Star Results**

Jail II, as it exists now without any improvements, uses 32% more energy than an average building with the same occupancy. With all of the recommended ECMs implemented, the building uses 9% less energy than the average building, which is not quite enough to meet EAp2. Like the Court Tower, this goal should be easier to achieve with a new controls system to monitor and adjust the building's operation to optimize its energy performance.




**Jail II Energy Star Results**

The Police Building, as it exists now without any improvements, uses more than twice the energy of an average building with the same occupancy. With all of the recommended ECMs implemented, the building uses 23% more energy than an average building. This is not enough to meet EAp2, but it is still a significant improvement. Like the other buildings, this goal should be easier to achieve with a new controls system to monitor and adjust the building's operation to optimize its energy performance.




# 1. Summary of Results

## 1.1 Court Tower/Atrium Results

After the Court Tower and Atrium building conditions were assessed, nine opportunities for energy improvement were identified and evaluated. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume. Lighting upgrades evaluated include replacing the lighting fixtures with LEDs, adding occupancy sensors, and implementing daylight harvesting. Potential envelope upgrades include installing a new roof, repairing the facade, and replacing the windows. Refer Section 4 for detailed descriptions of the ECMs and Section 8.1 for the lifecycle cost analysis.

The nine energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all nine energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by over $1,500,000 with a simple **payback of 19.3 years.** The **lifecycle cost difference is $8,138,685** over a period of 20 years.

| ECM # | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings: Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Metrics: Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| 1 | Occupancy Sensors | $145,311 | 358,149 | -4 | 44,967 | 1,757 | $41,164 | $0 | 20 | 3.5 | 3.5 |
| 2 | Variable Primary Pumps | $733,616 | 1,599,073 | 0 | 0 | 5,456 | $111,935 | $50,000 | 30 | 4.5 | 4.3 |
| 3 | Garage LED Lighting | $188,541 | 168,057 | 0 | 0 | 573 | $11,764 | $13,840 | 20 | 7.4 | 4.7 |
| 4 | LED Lighting Upgrade | $2,019,997 | 595,427 | 537 | 143,808 | 4,398 | $105,593 | $139,881 | 20 | 8.2 | 6.5 |
| 5 | VAV with Advanced Controls | $13,812,502 | 2,739,128 | 6,802 | 882,908 | 28,063 | $663,389 | $220,000 | 30 | 15.6 | 12.4 |
| 6 | Daylight Harvesting | $761,211 | 270,509 | 162 | 61,458 | 1,854 | $44,730 | $0 | 20 | 17.0 | 12.6 |
| 7 | Façade Maintenance | $685,462 | -15,192 | 1,108 | -15,283 | 1,088 | $18,487 | $0 | 40 | 37.1 | 12.9 |
| 8 | Window Upgrade | $12,684,627 | 553,384 | 6,953 | 261,675 | 13,330 | $290,151 | $0 | 30 | 43.7 | 18.1 |
| 9 | Roof Replacement | $2,081,972 | 1,700 | 74 | 575 | 101 | $1,992 | $0 | 40 | 1045.0 | 19.3 |
| **Total** | | **$33,113,238** | **6,270,235** | **15,632** | **1,380,108** | **56,621** | **$1,289,206** | **$423,721** | **29.9** | **19.3** | |

(1) Does not include cost of replacing existing HVAC system with the same equipment in five years.

ECMs 1-4 (shown in green) are low cost energy conservation measures that should be considered in the near term. ECMs 5-6 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 10 and 25 years. ECMs 7-8 (shown in orange) are capital-intensive projects that have SPPs of greater than 25 years and should be considered where synergies exist with other capital projects. ECM-9 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-6 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. If ECMs 7-8 are also selected, they should be implemented before or together with ECM-2 and ECM-5 to decrease the size of the new HVAC systems, resulting in a lower installation cost. ECM-9 is not recommended as an energy conservation project since the SPP is so long.

Upgrading the water closets, urinals, and lavatories to low flow was also assessed. These water conservation measures resulted in an annual utility and maintenance cost savings of $32,016 for the Court Tower and $2,921 for the Atrium, with a combined simple payback of 25.1 years.

## 1.2 Jail I Results

Eight opportunities for energy improvement were identified and evaluated for Jail I. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume and replacing the garage ventilation system. Lighting upgrades evaluated include replacing the lighting fixtures with LEDs and adding occupancy sensors. Potential envelope upgrades include installing a new roof and repairing the facade. Refer to Section 5 for detailed descriptions of the recommended ECMs and Section 8.2 for the lifecycle cost analysis.

The eight energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all eight energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by nearly $1,000,000 with a simple **payback of 12.1 years.** The **lifecycle cost difference is $12,886,563** over a period of 20 years.

| ECM # | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | | | | Metrics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| 1 | Occupancy Sensors | $60,779 | 591,016 | 60 | 82,450 | 3,078 | $72,409 | $0 | 20 | 0.8 | 0.8 |
| 2 | Garage Heat Recovery & CO2 | $475,952 | 121,649 | 3,814 | 0 | 4,969 | $94,759 | $0 | 30 | 5.0 | 3.2 |
| 3 | Variable Primary Pumps | $490,991 | 765,268 | 0 | 0 | 2,611 | $53,569 | $30,000 | 30 | 5.9 | 4.1 |
| 4 | LED Lighting Upgrade | $1,760,589 | 1,195,120 | -99 | 189,492 | 6,233 | $149,635 | $120,200 | 20 | 6.5 | 5.4 |
| 5 | Garage LED Lighting | $75,083 | 66,926 | 0 | 0 | 228 | $4,685 | $5,512 | 20 | 7.4 | 5.4 |
| 6 | Façade Maintenance | $636,435 | 69,080 | 2,197 | -3,250 | 2,820 | $53,332 | $0 | 40 | 11.9 | 6.0 |
| 7 | VAV with Advanced Controls | $7,040,204 | 1,385,672 | 4,787 | 257,383 | 13,532 | $297,891 | $50,000 | 30 | 20.2 | 11.3 |
| 8 | Roof Replacement | $799,465 | -13,152 | 105 | 942 | 91 | $1,782 | $0 | 40 | 448.7 | 12.1 |
| **Total** | | **$11,339,498** | **4,181,579** | **10,864** | **527,017** | **33,563** | **$728,062** | **$205,712** | **29.6** | **12.1** | |

ECMs 1-5 (shown in green) are low cost energy conservation measures that should be considered in the near term. ECMs 6-7 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 10 and 25 years. ECM-8 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-7 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. ECM-8 is not recommended as an energy conservation project since the SPP is so long.

## 1.3 Jail II Results

Five opportunities for energy improvement were identified and evaluated for Jail II. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume. Lighting upgrades evaluated include replacing the lighting fixtures with LEDs and adding occupancy sensors. Potential envelope upgrades include installing a new roof. Refer to Section 6 for detailed descriptions of the recommended ECMs and Section 8.3 for the lifecycle cost analysis.

The five energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all five energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by over $300,000 with a simple **payback of 16.5 years.** The **lifecycle cost difference is $4,637,077** over a period of 20 years.

| ECM # | ECM DESCRIPTION | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | | | | Metrics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
| | | $ | kWh | klbs | ton hours | MMBtu | $ | $ | Years | Years | Years |
| 1 | Occupancy Sensors | $51,923 | 99,188 | -86 | 9,333 | 347 | $8,351 | $0 | 20 | 6.2 | 6.2 |
| 2 | LED Lighting Upgrade | $547,170 | 367,266 | -476 | 38,767 | 1,150 | $28,897 | $23,460 | 20 | 10.5 | 9.9 |
| 3 | VAV with Advanced Controls | $3,790,099 | 986,794 | 4,710 | -75,617 | 8,083 | $148,336 | $80,000 | 30 | 16.6 | 15.2 |
| 4 | Variable Speed Pumps | $280,293 | 237,335 | 0 | 0 | 810 | $16,613 | $0 | 30 | 16.9 | 15.3 |
| 5 | Roof Replacement | $398,199 | 2,706 | 52 | 1,417 | 88 | $1,872 | $0 | 40 | 212.8 | 16.5 |
| **Total** | | **$5,067,682** | **1,693,289** | **4,199** | **-26,100** | **10,478** | **$204,070** | **$103,460** | **29.6** | **16.5** | |

ECM 1 (shown in green) is a low cost energy conservation measure that should be considered in the near term. ECMs 2-4 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 10 and 25 years. ECM-5 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-4 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. ECM-5 is not recommended as an energy conservation project since the SPP is so long.

## 1.4 Police Building Results

Seven opportunities for energy improvement were identified and evaluated for the Police Building. Potential HVAC system upgrades include converting the airside and waterside systems to variable volume. Lighting upgrades evaluated include replacing the interior lighting fixtures with LEDs, adding occupancy sensors, and upgrading the garage lights to LED. Potential envelope upgrades include installing a new roof and repairing the facade. Refer to Section 7 for detailed descriptions of the recommended ECMs and Section 8.4 for the lifecycle cost analysis.

The seven energy conservation measures were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. The maintenance cost savings of each energy conservation measure was also considered. With all seven energy conservation measures implemented, the building is anticipated to reduce its annual energy and maintenance costs by over $500,000 with a simple **payback of 8.7 years.** The **lifecycle cost difference is $11,162,292** over a period of 20 years.

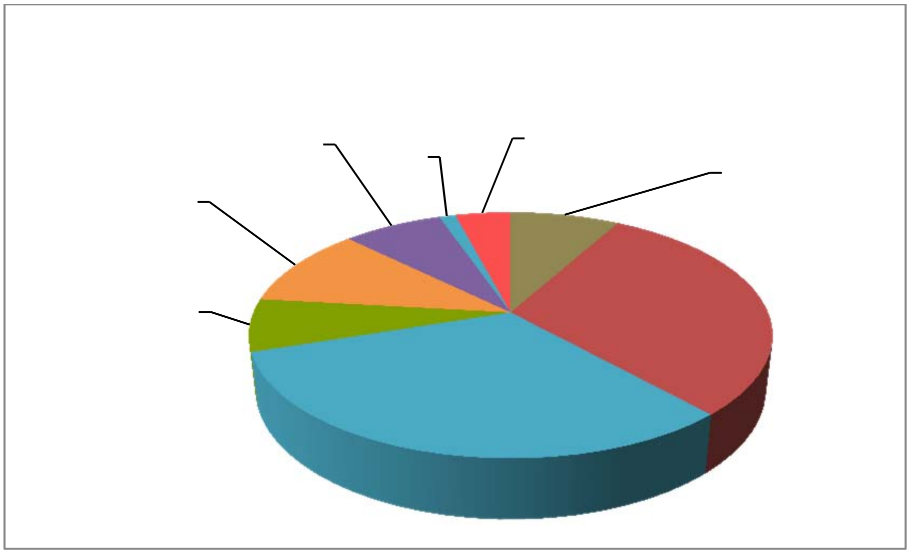
| | | | Electricity | District Steam | District Chilled Water | Total Energy | Energy Cost Savings | Maintenance Cost Savings (1) | Expected Useful life | Simple Payback Period (SPP) | Cumulative SPP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *$* | *kWh* | *klbs* | *ton hours* | *MMBtu* | *$* | *$* | *Years* | *Years* | *Years* |
| 1 | Occupancy Sensors | $107,855 | 906,517 | -385 | 88,750 | 3,698 | $86,697 | $0 | 20 | 1.2 | 1.2 |
| 2 | LED Lighting Upgrade | $1,291,280 | 1,219,172 | -181 | 172,492 | 6,014 | $143,345 | $133,109 | 20 | 4.7 | 3.9 |
| 3 | Façade Maintenance | $352,648 | 6,020 | 1,951 | 8,242 | 2,449 | $47,497 | $0 | 40 | 7.4 | 4.3 |
| 4 | Variable Speed Pumps | $365,462 | 446,325 | 0 | 0 | 1,523 | $31,243 | $10,000 | 30 | 8.9 | 4.7 |
| 5 | VAV with Advanced Controls | $3,565,081 | 807,637 | 2,317 | 387,292 | 10,170 | $248,345 | $30,000 | 30 | 12.8 | 7.8 |
| 6 | Garage LED Lighting | $126,104 | 84,201 | -94 | 0 | 175 | $3,768 | $4,547 | 20 | 15.2 | 7.9 |
| 7 | Roof Replacement | $591,627 | -1,096 | 44 | 900 | 59 | $1,232 | $0 | 40 | 480.2 | 8.7 |
| **Total** | | **$6,400,057** | **3,468,776** | **3,651** | **657,675** | **24,087** | **$562,127** | **$177,657** | **29.1** | **8.7** | |

ECMs 1-4 (shown in green) are low cost energy conservation measures that should be considered in the near term. ECMs 5-6 (shown in yellow) are capital-investment projects with a simple payback period (SPP) of between 5 and 25 years. ECM-7 (shown in red) has a very long SPP and should not be implemented based on energy savings alone. At a minimum, we recommend implementing ECMs 1-6 in the near future since the SPP is reasonable and the improvements will have a significant effect on the building's operation and maintenance costs. ECM-7 is not recommended as an energy conservation project since the SPP is so long.

Upgrading the water closets, urinals, and lavatories to low flow was also assessed. These water conservation measures resulted in an annual utility and maintenance cost savings of $59,428, with a simple payback of 10.8 years.

## 2. Court Tower/Atrium ECMs

The largest energy consumer in a typical office building is the HVAC system. The Court Tower and Atrium's HVAC system uses 80% of the building's energy, including steam for heating, chilled water for cooling, and electricity to circulate air and water throughout the building. Refer to the figure below for a breakdown of the building complex's energy consumption.



Since the HVAC system uses so much energy, there is a large opportunity for energy savings. However, we recommend improving the building's lighting and envelope systems before or together with the HVAC upgrades. This will decrease the size of the new HVAC systems, saving money in equipment, installation costs, and utility costs by operating appropriately sized systems. One primary recommendation is converting the pumps to variable primary flow and replacing the induction system with a variable air volume system. Once all of the main air handling units are upgraded to VAV, several advanced controls strategies can be implemented to further optimize the energy performance of the system.

The lighting systems are typically under maintained, energy inefficient, and utilize dated technologies. Even though the lights themselves only consume 8% of the building's energy, the heat load generated by inefficient lighting contributes to an additional 5% of the building's cooling and fan energy. This also increases the building chilled water demand by 140 tons. To remedy these conditions and improve the quality of light, recommended strategies include replacing the existing lighting, optimizing the layout and configuration for energy efficiency and quality of light, and incorporating lighting controls such as occupancy sensors and daylight harvesting.

The poor envelope conditions result in 17% of the buildings' energy consumption for heating, cooling, and fan energy. The main contributors are infiltration through damaged seals and joints in the walls and inefficient, single pane windows. Envelope improvements recommended to improve the Court Tower and Atrium's energy efficiency include repairing the sealants and caulk joints between the granite panels, applying water repellents to the stone panels, and replacing the single pane windows with energy efficient double pane glass. The roof should be replaced due to its poor condition, but the energy savings are minimal.

These nine energy conservation measures recommended to improve the building's HVAC, lighting, and envelope were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. Each ECM is described below, in order of shortest to longest payback. Refer to Appendix D for detailed cost estimates of each ECM.

## 2.1 ECM-1: Occupancy Sensors

At the Court Tower and Atrium, lights primarily remain on during building operational hours even when spaces are unoccupied. The only areas that currently have occupancy sensor control are the open offices and jury waiting rooms. We recommend installing occupancy sensors in private offices, conference rooms, jury rooms, break rooms, and restrooms. Refer to Occupancy Sensors in Appendix B for more information about this ECM. This energy conservation measure is relatively inexpensive to implement and reduces the building's lighting energy by about 15%. This energy conservation measure has a simple payback of only 3.5 years and should be implemented as part of the lighting upgrades.

| ECM 1: Occupancy Sensors | |
|---|---|
| Implementation Cost | $145,311 |
| Annual Energy Cost Savings | $41,164 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **3.5 years** |
| **Expected Useful Life** | **20.0 years** |

## 2.2 ECM-2: Variable Primary Pumps

The existing heating hot water and chilled water pumps are configured in a constant flow, primary-secondary arrangement. There are three primary pumps at the heating plant, three primary pumps at the cooling plant, and thirty-eight secondary pumps serving the air handlers and induction window units. We recommend removing the secondary pumps and adding variable frequency drives to new primary pumps. Refer to Variable Primary Pumps in Appendix A for more information about this ECM.

Since the new system will utilize primary pumps only, the thirty-eight secondary pumps will not be needed and water flow will be regulated using modulating control valves. This energy conservation measure is relatively inexpensive to implement compared to some of the other ECMs and results in substantial energy and maintenance cost savings, with a payback of only 4.5 years. Refer to the table below for the cost breakdown.

| ECM 2: Variable Primary Pumps | |
|---|---|
| Implementation Cost | $733,616 |
| Annual Energy Cost Savings | $111,935 |
| Annual Maintenance Savings | $50,000 |
| **Simple Payback Period** | **4.5 years** |
| **Expected Useful Life** | **30.0 years** |

## 2.3 ECM-3: Parking Garage LED Lighting

The Court Tower's garage lighting consists of high pressure sodium (HPS) fixtures. The lights are inefficient, expensive to maintain, and provide poor quality lighting. We recommend replacing the HPS lights with LED fixtures. The LED fixtures save electricity, but they also save more money per year in maintenance costs. This ECM has a simple payback of 7.4 years.

| ECM 3: Garage LED Lighting | |
|---|---|
| Implementation Cost | $188,541 |
| Annual Energy Cost Savings | $11,764 |
| Annual Maintenance Savings | $13,840 |
| **Simple Payback Period** | **7.4 years** |
| **Expected Useful Life** | **20.0 years** |

## 2.4 ECM-4: LED Lighting Upgrade

We recommend upgrading the areas with high lighting power densities to LED lighting. If all of the lights in the building are upgraded, the first cost will increase and in turn the payback will be slightly longer. Refer to LED Lighting Upgrade in Appendix B for more information about LED technology. The lighting power densities for the existing building and proposed LED lighting upgrades were modeled as follows in the Court Tower and Atrium gallery:

| Space Type | Existing LPD | LED Lighting LPD |
|---|---|---|
| **Conference** | 2.2 W/sf | 0.9 W/sf |
| **Gallery/Lobby** | 1.5 W/sf | 0.9 W/sf |
| **Jury Waiting** | 1.3 W/sf | 0.9 W/sf |
| **Open/Private Office** | 1.6 W/sf | 0.8 W/sf |

This energy conservation measure is estimated to reduce the building's annual lighting energy consumption by 27% and the building's cooling energy by 5%. In addition to this, the maintenance costs will be less since the LEDs will last 15-20 years compared to the existing fluorescent lights which need to have lamps and ballasts replaced approximately every 6 years. The drivers on the LED fixtures will need to be replaced about every 5 years, but the cost is minimal compared to maintaining the fluorescent lights. Replacing the existing lights results in a payback of 8.2 years.

| ECM 4: LED Lighting Upgrade | |
|---|---|
| Implementation Cost | $2,019,997 |
| Annual Energy Cost Savings | $105,593 |
| Annual Maintenance Savings | $139,881 |
| **Simple Payback Period** | **8.2 years** |
| **Expected Useful Life** | **20.0 years** |

## 2.5 ECM-5: VAV System Conversion

The interior spaces in the Court Tower are served by four variable air volume (VAV) air handling units, zoned by the north and south sides on the lower and upper floors. Two additional VAV air handlers serve the Atrium for a total of six interior AHUs. The perimeters of the Court Tower and Atrium have induction window units that are supplied with air from four constant volume, 100% outside air units.

We recommend removing the four constant volume induction air handling units and replacing the six existing VAV air handlers. Refer to VAV System Conversion in Appendix A for more information about this ECM. Once all of the main air handling units are upgraded to VAV, several advanced controls strategies can be implemented to further optimize the energy performance of the system, including demand control ventilation, critical zone reset, adaptive unoccupied set back, and zone-level HVAC set back. Refer to the Advanced Controls sections in Appendix A for descriptions of these improvements.

From a maintenance perspective this measure is anticipated to save an annual $220,000 for maintaining fewer units in terms of staff and time. Even though this energy conservation measure will be expensive to implement, it will save a significant amount of energy and maintenance costs, resulting in a simple payback of 15.6 years. Refer to the following table for the cost breakdown.

| ECM 5: VAV with Advanced Controls | |
|---|---|
| Implementation Cost | $13,812,502 |
| Annual Energy Cost Savings | $663,389 |
| Annual Maintenance Savings | $220,000 |
| **Simple Payback Period** | **15.6 years** |
| **Expected Useful Life** | **30.0 years** |

This analysis does not take into account the fact that the existing HVAC system will need to be replaced within five years due to the equipment being at the end of its service life. If the system was replaced in its current form of ten air handling units and 38 secondary HVAC pumps, we estimate the cost to be $21,342,450. Using the same HVAC configuration, the total system airflow needs to increase to 555,000 cfm, or 30% greater than the existing system size of 427,000 cfm. This is due to the increased occupancy and internal loads over the original design intent.

If the system is converted to a complete VAV system, the total system airflow will only need to be 470,000 cfm since the airflow can be reduced due to diversity in thermal loads at the perimeter spaces facing different directions. If all of the energy conservation measures recommended in this Report is implemented, the total system size can be decreased even further to about 365,000 cfm, which is 17% less than the current system. A smaller system size, reduced number of air handling units, and less complicated system decreases the first cost of equipment and ductwork modifications substantially.

### 2.6 ECM-6: Daylight Harvesting

The exterior office areas in the Court Tower have sufficient access to daylight for daylight harvesting. In addition to this, the Atrium gallery provides a great opportunity for daylight harvesting through both the windows and skylights on the roof. Refer to Daylight Harvesting in Appendix B for more information.

Since there are many areas in the building with access to daylight, this energy conservation measure will reduce the lighting energy by about 12%.

| ECM 6: Daylight Harvesting | |
|---|---|
| Implementation Cost | $761,211 |
| Annual Energy Cost Savings | $44,730 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **17.0 years** |
| **Expected Useful Life** | **20.0 years** |

The implementation cost was determined with the assumption that the existing fluorescent lights would remain and that the ballasts would need to be upgraded to dimmable ballasts. To reduce the installation cost, this ECM should be implemented together with ECM-4, LED Lighting Upgrade.

### 2.7 ECM-7: Facade Maintenance

We recommend repairing the sealants and caulk joints between the granite panels and applying water repellents to the stone panels to reduce infiltration. Additional information about this ECM can be found in the Facade Maintenance section in Appendix C.

The resulting payback of 37 years for the Court Tower is somewhat long, but repairing the existing facade will provide an energy savings benefit while being significantly less expensive than replacing the existing panes. It is important to recognize that this work is required to mitigate water and air infiltration to the interior. Refer to the table below for the cost breakdown.

| ECM 7: Façade Maintenance | |
|---|---|
| Implementation Cost | $685,462 |
| Annual Energy Cost Savings | $18,487 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **37.1 years** |
| **Expected Useful Life** | **40.0 years** |

### 2.8 ECM-8: Window Upgrade

We recommend replacing the windows on the Court Tower only. The curtainwall and skylights on the Atrium building will be difficult to replace, so this energy conservation measure is not recommended for the Atrium. Refer to Window Upgrade in Appendix C for more information about this ECM.

Replacing the windows will save a significant amount of heating and cooling energy since the existing window heat transfer is so high. However, it will be very expensive to replace the windows, especially since installation is more difficult on a high-rise building. Replacing the windows before or together with the HVAC system is recommended so the size of the installed equipment can be reduced.

| ECM 8: Window Upgrade | |
|---|---|
| Implementation Cost | $12,684,627 |
| Annual Energy Cost Savings | $290,151 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **43.7 years** |
| **Expected Useful Life** | **30.0 years** |

## 2.9 ECM-9: Roof Replacement

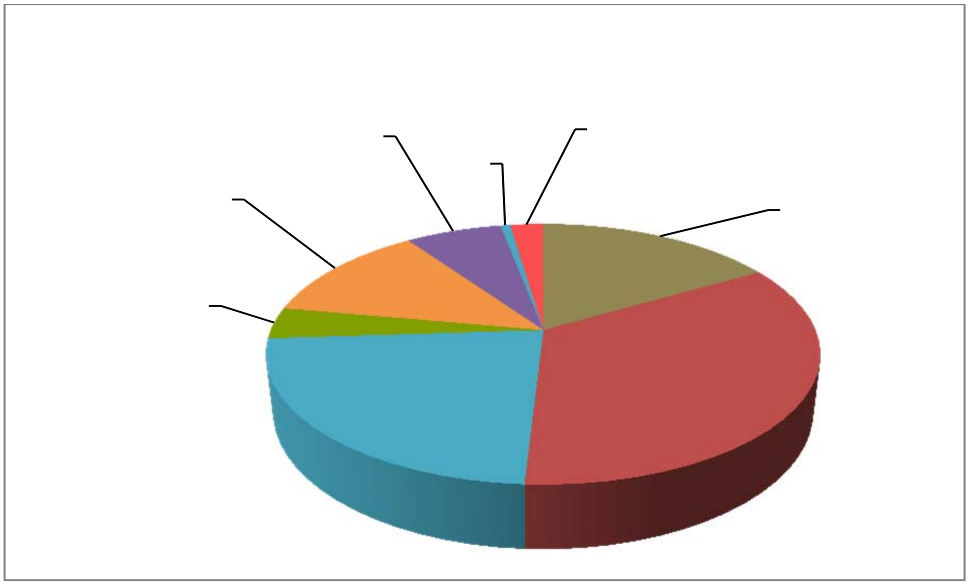
We recommend replacing the existing R-14.7 roof with a new R-25 roof. Refer to Roof Replacement in Appendix C for more information about this ECM.

For the Court Tower, the energy cost savings is very low compared to that of a low-rise building. Since the building is a high-rise, the area of the roof is minimal so there is not much heat transfer through the roof compared to the heat loss and heat gain through the walls. Furthermore, the top two floors of the Court Tower are mechanical equipment rooms that are semi-heated by unit heaters and are not mechanically cooled. The energy used to condition these rooms is minimal, so replacing the roof does not significantly decrease the energy savings. Since the roof is expensive to replace due to moving the heavy paver stones over such a long vertical height, the simple payback is over 1,000 years. The roof still needs to be replaced at some point due to its condition, but this upgrade should not be considered solely for energy conservation.

| ECM 9: Roof Replacement | |
|---|---|
| Implementation Cost | $2,081,972 |
| Annual Energy Cost Savings | $1,992 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **1045.0 years** |
| **Expected Useful Life** | **40.0 years** |

## 3. Jail I ECMs

The HVAC system is also the largest energy consumer of Jail I, using 73% of the building's total energy. Energy needed for cooling is less than the Court Tower since the windows are smaller and there are less internal equipment loads such as computers and office equipment. Energy needed for lighting is greater than the Court Tower since the building is occupied longer hours. Refer to the figure below for a breakdown of the building's energy consumption.



Improving the HVAC system will result in the greatest amount of savings since the system uses so much energy. However, the building's lighting and envelope systems should be upgraded before or together with the building's HVAC system to reduce installation costs and optimize the building's performance. HVAC improvements recommended for Jail I include replacing the garage ventilation units, converting the pumps to variable primary operation, and changing the air distribution system to VAV.

The lighting systems in this building are also under maintained, energy inefficient, and utilize dated technologies. To remedy these conditions and improve the quality of light, recommended strategies include replacing the existing lighting, optimizing the layout and configuration for energy efficiency and quality of light, and incorporating occupancy sensor control. There are not many areas in the building with access to natural light, so daylight harvesting is not recommended.

The poor envelope conditions in Jail I result in an increase in the building's heating and fan energy, but the cooling energy is not significantly impacted. The windows in this building account for less than 20% of the wall area, so replacing the windows is not recommended. Most of the heat loss occurs through the walls, so repairing the facade results in more savings than at the Court Tower. The roof should be replaced due to its poor condition, but the energy savings are minimal.

These eight energy conservation measures recommended to improve the building's HVAC, lighting, and envelope were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. Each ECM is described below, in order of shortest to longest payback. Refer to Appendix E for detailed cost estimates of each ECM.

## 3.1 ECM-1: Occupancy Sensors

At Jail I, lights primarily remain on during building operational hours even when spaces are unoccupied. Occupancy sensors are not currently utilized in most areas of this building. We recommend installing occupancy sensors in the office areas, conference rooms, dining rooms, laundry room, kitchen, locker rooms, and restrooms. Refer to Occupancy Sensors in Appendix B for more information about this ECM.

This energy conservation measure is relatively inexpensive to implement and reduces the building's lighting energy significantly. The energy savings are greater and the payback is shorter than the Court Tower since the building is occupied longer hours. This energy conservation measure has a simple payback of less than one year and should be implemented as part of the lighting upgrades.

| ECM 1: Occupancy Sensors | |
|---|---|
| Implementation Cost | $60,779 |
| Annual Energy Cost Savings | $72,409 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **0.8 years** |
| **Expected Useful Life** | **20.0 years** |

## 3.2 ECM-2: Garage Heat Recovery & CO Control

The existing garage heating and ventilation units are deteriorating and the heat recovery is not working. In addition to this, the system operation is inefficient. During off-peak travel times, there is not as much traffic in the garage. The system wastes energy by heating and circulating air that is not needed to ventilate or heat the garage.

We recommend replacing the existing units with new air handlers with heat recovery and the installation of carbon monoxide sensors throughout the garage to reduce the energy required to heat the garage in the winter. In addition to this, the units should have the capability to modulate airflow based on the carbon monoxide level as well as maintaining minimum space temperature set point. This ECM has a simple payback of only 5 years.

| ECM 2: Garage Heat Recovery & CO2 | |
|---|---|
| Implementation Cost | $475,952 |
| Annual Energy Cost Savings | $94,759 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **5.0 years** |
| **Expected Useful Life** | **30.0 years** |

### 3.3 ECM-3: Variable Primary Pumps

The existing heating hot water and chilled water pumps are configured in a constant flow, primary-secondary arrangement. We recommend removing the secondary pumps and adding variable frequency drives to new primary pumps. Refer to Variable Primary Pumps in Appendix A for more information about this ECM. The primary chilled water pumps serving Jail I are located at the Court Tower, so the energy and maintenance cost savings for this ECM was split proportionally between Court Tower/Atrium and Jail I.

The new system will utilize primary pumps only and twenty-one less pumps will be needed since water flow will be regulated using modulating control valves. This energy conservation measure is relatively inexpensive to implement compared to some of the other ECMs and results in substantial energy and maintenance cost savings, with a payback of only 5.9 years. Refer to the table below for the cost breakdown.

| ECM 3: Variable Primary Pumps | |
|---|---|
| Implementation Cost | $490,991 |
| Annual Energy Cost Savings | $53,569 |
| Annual Maintenance Savings | $30,000 |
| **Simple Payback Period** | **5.9 years** |
| **Expected Useful Life** | **30.0 years** |

### 3.4 ECM-4: LED Lighting Upgrade

We recommend upgrading the areas with high lighting power densities to LED lighting. If all of the lights in the building are upgraded, the first cost will increase and in turn the payback will be slightly longer. Refer to LED Lighting Upgrade in Appendix B for more information about LED technology. The lighting power densities for the existing building and proposed LED lighting upgrades were modeled as follows in the Jail I building:

| Space Type | Existing LPD | LED Lighting LPD |
|---|---|---|
| **Conference** | 2.2 W/sf | 0.9 W/sf |
| **Prep/Visitation** | 1.5 W/sf | 0.9 W/sf |
| **Jail Cells** | 1.1 W/sf | 0.6 W/sf |
| **Medical Exam** | 1.6 W/sf | 1.1 W/sf |
| **Office Space** | 1.6 W/sf | 0.8 W/sf |

This energy conservation measure is estimated to reduce the building's annual lighting energy consumption by 30% and the building's cooling energy by 13%. In addition to this, the maintenance costs will be reduced by $120,200 per year. Even though this energy conservation measure is slightly expensive to implement, the energy and maintenance savings result in a payback of only 6.5 years.

| ECM 4: LED Lighting Upgrade | |
|---|---|
| Implementation Cost | $1,760,589 |
| Annual Energy Cost Savings | $149,635 |
| Annual Maintenance Savings | $120,200 |
| **Simple Payback Period** | **6.5 years** |
| **Expected Useful Life** | **20.0 years** |

## 3.5 ECM-5: Parking Garage LED Lighting

Jail I's garage lighting consists of high pressure sodium (HPS) fixtures. The lights are inefficient, expensive to maintain, and provide poor quality lighting. We recommend replacing the HPS lights with LED fixtures. The LED fixtures save electricity, but they also save more money per year in maintenance costs. This ECM has a simple payback of 7.4 years.

| ECM 5: Garage LED Lighting | |
|---|---|
| Implementation Cost | $75,083 |
| Annual Energy Cost Savings | $4,685 |
| Annual Maintenance Savings | $5,512 |
| **Simple Payback Period** | **7.4 years** |
| **Expected Useful Life** | **20.0 years** |

## 3.6 ECM-6: Facade Maintenance

We recommend repairing the sealants and caulk joints between the granite panels and applying water repellents to the stone panels to reduce infiltration. Additional information about this ECM can be found in the Facade Maintenance section in Appendix C.

The energy cost savings for this ECM is much greater for Jail I than the Court Tower since the wall to window area is greater and there is more heat loss though the walls. This ECM has a simple payback of 11.9 years and reduces the building's steam use for space heating by 10%. Refer to the table below for the cost breakdown.

| ECM 6: Façade Maintenance | |
|---|---|
| Implementation Cost | $636,435 |
| Annual Energy Cost Savings | $53,332 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **11.9 years** |
| **Expected Useful Life** | **40.0 years** |

## 3.7 ECM-7: VAV System Conversion

The interior spaces in Jail I are served by four variable air volume (VAV) air handling units, zoned by each northeast, northwest, southeast, and southwest corner. The east and west perimeters of Jail I have induction window units that are supplied with air from two constant volume, 100% outside air units.

We recommend removing the two constant volume induction air handling units and replacing the four existing VAV air handlers. Refer to VAV System Conversion in Appendix A for more information about this ECM. Once all of the main air handling units are upgraded to VAV, several advanced controls strategies can be implemented to further optimize the energy performance of the system, including demand control ventilation, critical zone reset, and zone-level HVAC set back. System level setback is not recommended for this building since many areas are occupied continuously on nights and weekends. Refer to the Advanced Controls sections in Appendix A for descriptions of these improvements.

From a maintenance perspective this measure is anticipated to save $50,000 annually for maintaining fewer units in terms of staff and time. Even though this energy conservation measure will be expensive to implement, it will save a significant amount of energy and maintenance costs, resulting in a simple payback of 20.4 years. The payback for this ECM is longer than the Court Tower since energy cannot be saved by turning the systems off when the building is unoccupied. Refer to the following table for the cost breakdown.

| ECM 7: VAV with Advanced Controls | |
|---|---|
| Implementation Cost | $7,081,577 |
| Annual Energy Cost Savings | $297,891 |
| Annual Maintenance Savings | $50,000 |
| **Simple Payback Period** | **20.4 years** |
| **Expected Useful Life** | **30.0 years** |

This analysis does not take into account the fact that the existing HVAC system will need to be replaced within ten years due to the equipment being at the end of its service life. If the system was replaced in its current form of six air handling units and 24 secondary HVAC pumps, we estimate the cost to be $15,964,440.

If the system is converted to a complete VAV system, the total system airflow can be reduced by 30% or 90,000 cfm. A smaller system size, reduced number of air handling units, and less complicated system decreases the first cost of equipment and ductwork modifications substantially. If all of the energy conservation measures recommended in this Report are implemented, the total system size can be decreased even further by 20,000 more cfm.

## 3.8 ECM-8: Roof Replacement

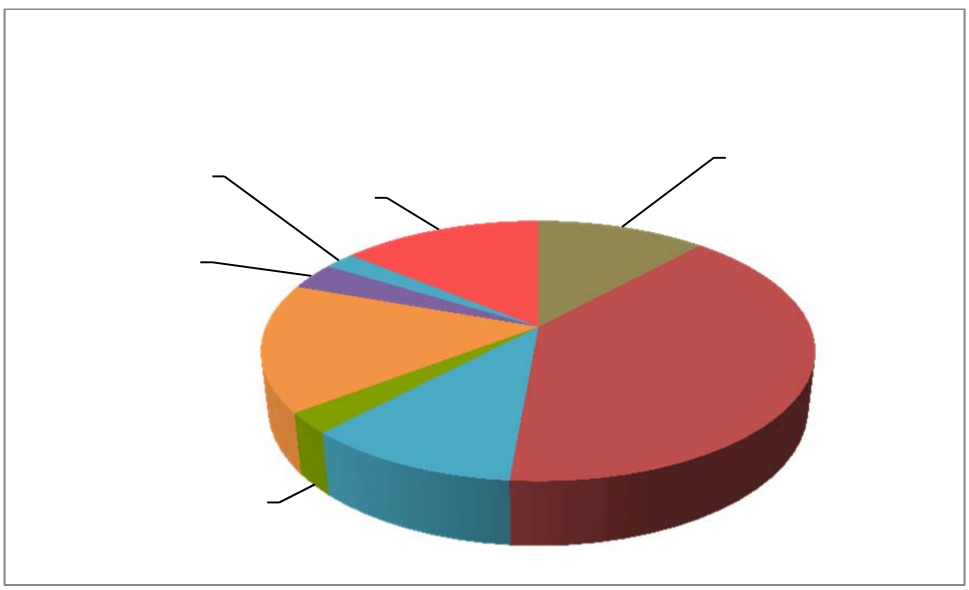
We recommend replacing the existing R-14.7 roof with a new R-25 roof. Refer to Roof Replacement in Appendix C for more information about this ECM.

For Jail I, the energy cost savings is greater than the Court Tower when compared to the overall energy consumption of the building, but the savings are still minimal. This ECM is less expensive to implement at Jail I since the paver stones do not need to be moved as far, but the payback is still very long. We recommend replacing the roof when its condition deteriorates enough to warrant replacement, but this upgrade should not be considered solely for energy conservation.

| ECM 8: Roof Replacement | |
|---|---|
| Implementation Cost | $799,465 |
| Annual Energy Cost Savings | $1,782 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **448.7 years** |
| **Expected Useful Life** | **40.0 years** |

## 4. Jail II ECMs

The HVAC system is also the largest energy consumer of Jail II, using 69% of the building's total energy. Energy needed for cooling is less than Jail I since the building has very little windows, only about 10% of its total wall area. The building's lighting power density is less than Jail I in most areas, resulting in less energy for both lighting and cooling. Steam used for space heating is the largest energy consumer, resulting from greater volumes of air heated than necessary in a constant volume system. Refer to the figure below for a breakdown of the building's energy consumption.



Improving the HVAC system will result in the greatest amount of savings since the system uses so much energy. However, the building's lighting and envelope systems should be upgraded before or together with the building's HVAC system to reduce installation costs and optimize the building's performance. HVAC improvements recommended for Jail II include converting the pumps to variable speed operation and changing the air distribution system to VAV.

The lighting systems in this building are under maintained and slightly energy inefficient but not as much compared to the other buildings. We recommend replacing the existing lighting, optimizing the layout and configuration for energy efficiency and quality of light, and incorporating occupancy sensor control. There are not many areas in the building with access to natural light, so daylight harvesting is not recommended.

Jail II's facade is not as energy inefficient as the other buildings since the building is much newer and has very little window area. The roof should be replaced due to its poor condition, but the energy savings are minimal.

These five energy conservation measures recommended to improve the building's HVAC, lighting, and envelope were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. Each ECM is described below, in order of shortest to longest payback. Refer to Appendix F for detailed cost estimates of each ECM.

## 4.1 ECM-1: Occupancy Sensors

At Jail II, lights primarily remain on during building operational hours even when spaces are unoccupied. Occupancy sensors are currently not utilized in this building, with the exception of the first floor which was recently renovated. We recommend installing occupancy sensors in the office areas, conference rooms, break rooms, dining rooms, recreation rooms, laundry room, kitchen, locker rooms, and restrooms. Refer to Occupancy Sensors in Appendix B for more information about this ECM.

This energy conservation measure is relatively inexpensive to implement and has a relatively short payback of 6.2 years. The energy savings are less than Jail I since the installed lighting power density is less and there are less areas where occupancy sensors can be installed. Refer to the table below for a cost breakdown of this ECM.

| ECM 1: Occupancy Sensors | |
|---|---|
| Implementation Cost | $51,923 |
| Annual Energy Cost Savings | $8,351 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **6.2 years** |
| **Expected Useful Life** | **20.0 years** |

## 4.2 ECM-2: LED Lighting Upgrade

We recommend upgrading the areas with high lighting power densities to LED lighting. If all of the lights in the building are upgraded, the first cost will increase and in turn the payback will be slightly longer. Refer to LED Lighting Upgrade in Appendix B for more information about LED technology. The lighting power densities for the existing building and proposed LED lighting upgrades were modeled as follows in the Jail II building:



| Space Type | Existing LPD | LED Lighting LPD |
|---|---|---|
| **Corridor** | 0.8 W/sf | 0.4 W/sf |
| **Day Room** | 1.5 W/sf | 0.8 W/sf |
| **Locker Room** | 0.8 W/sf | 0.4 W/sf |
| **Office Space** | 1.0 W/sf | 0.8 W/sf |
| **Recreation** | 1.0 W/sf | 0.8 W/sf |
| **Restroom** | 1.1 W/sf | 0.6 W/sf |
| **Storage** | 0.8 W/sf | 0.6 W/sf |

This energy conservation measure is estimated to reduce the building's annual lighting energy consumption by 30% and the building's cooling energy by 13%. The energy cost savings are less than Jail I since the existing lighting power density is already less in many spaces. Therefore, the payback of 10.5 years is slightly longer than for Jail I. Refer to the table below for a cost breakdown of this ECM.

| ECM 2: LED Lighting Upgrade | |
|---|---|
| Implementation Cost | $547,170 |
| Annual Energy Cost Savings | $28,897 |
| Annual Maintenance Savings | $23,460 |
| **Simple Payback Period** | **10.5 years** |
| **Expected Useful Life** | **20.0 years** |

### 4.3 ECM-3: VAV System Conversion

A total of fourteen main air handling units serve Jail II, not counting the small dedicated units serving areas such as the kitchens, laundry room, controls rooms, and electrical rooms. One air handler with inlet guide vanes serves each of the first and fourth floors, with fan-powered and VAV terminal units. Two constant volume multi-zone units serve each of the second, third, fifth/sixth, seventh/eighth, ninth/tenth, and eleventh/twelfth floors, zoned by the east and west sides of the building.

We recommend converting all of the units to VAV systems with variable frequency drives and combining some of the air handling units so there are less units to maintain and to take advantage of diversity. Recommended zoning is as follows:

- AHU-1-1: Keep zoning as exists on first floor
- AHU-2-1/2-2/3-1/3-3: Combine into one unit located in the south mechanical room on either the second or third floor, with new ductwork risers up or down to the other floor
- AHU-4-1: Keep zoning as exists on fourth floor
- AHU-6-1/8-1/10-1/12-1: Combine into one unit located in the west mechanical room on either the eighth or tenth floor, with new ductwork risers up or down to the other floors
- AHU-6-2/8-2/10-2/12-2: Combine into one unit located in the east mechanical room on either the eighth or tenth floor, with new ductwork risers up or down to the other floors

The fan-powered and VAV terminal units will be replaced with units with direct digital controls (DDC) on the fourth floor, with new VAV boxes added to the existing zones on floors 2-3 and 5-12. Terminal units on the first floor do not need to be replaced since they were upgraded during the last renovation. Since the new air handlers will have variable air volume control, they will be able to maintain thermal comfort better than the existing system while requiring less maintenance with fewer units. Refer to VAV System Conversion in Appendix A for more information about this ECM.

Once all of the main air handling units are upgraded to VAV, several advanced controls strategies can be implemented to further optimize the energy performance of the system, including demand control ventilation, critical zone reset, and zone-level HVAC set back. System level setback is not recommended for this building since many areas are occupied continuously on nights and weekends. Refer to the Advanced Controls sections in Appendix A for descriptions of these improvements.

From a maintenance perspective this measure is anticipated to save an annual $80,000 for maintaining fewer units in terms of staff and time. Even though this energy conservation measure will be expensive to implement, it will save a significant amount of energy and maintenance costs, resulting in a simple payback of 16.6 years. Steam for space heating will be reduced by 40% and electricity for fan energy will be reduced by nearly 50%. Refer to the following table for the cost breakdown.

| ECM 3: VAV with Advanced Controls | |
|---|---|
| Implementation Cost | $3,790,099 |
| Annual Energy Cost Savings | $148,336 |
| Annual Maintenance Savings | $80,000 |
| **Simple Payback Period** | **16.6 years** |
| **Expected Useful Life** | **30.0 years** |

This analysis does not take into account the fact that the existing HVAC system will need to be replaced within five years due to the equipment being at the end of its service life. If the system was replaced in its current form of fourteen air handling units, we estimate the cost to be $6,785,670.

If the system is converted to a complete VAV system, the total system airflow can be reduced by 30% or 35,000 cfm. A smaller system size, reduced number of air handling units, and less complicated system decreases the first cost of equipment and ductwork modifications substantially.

### 4.4 ECM-4: Variable Speed Pumps

The existing heating hot water and chilled water pumps are configured in a constant flow, primary only arrangement. We recommend adding variable frequency drives to new primary pumps to change their operation to variable flow. Refer to Variable Primary Pumps in Appendix A for more information about this ECM.

The number of pumps will not be reduced, so there will not be any maintenance savings. Therefore, the payback is greater than Court Tower and Jail I. Refer to the table below for the cost breakdown.

| ECM 4: Variable Primary Pumps | |
|---|---|
| Implementation Cost | $280,293 |
| Annual Energy Cost Savings | $16,613 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **16.9 years** |
| **Expected Useful Life** | **30.0 years** |

### 4.5 ECM-5: Roof Replacement

We recommend replacing the existing R-14.7 roof with a new R-25 roof. Refer to Roof Replacement in Appendix C for more information about this ECM.

The savings and payback are similar to Jail I, being better than the Court Tower but still not enough to make this ECM worthwhile. We recommend replacing the roof when its condition deteriorates enough to warrant replacement, but this upgrade should not be considered solely for energy conservation.

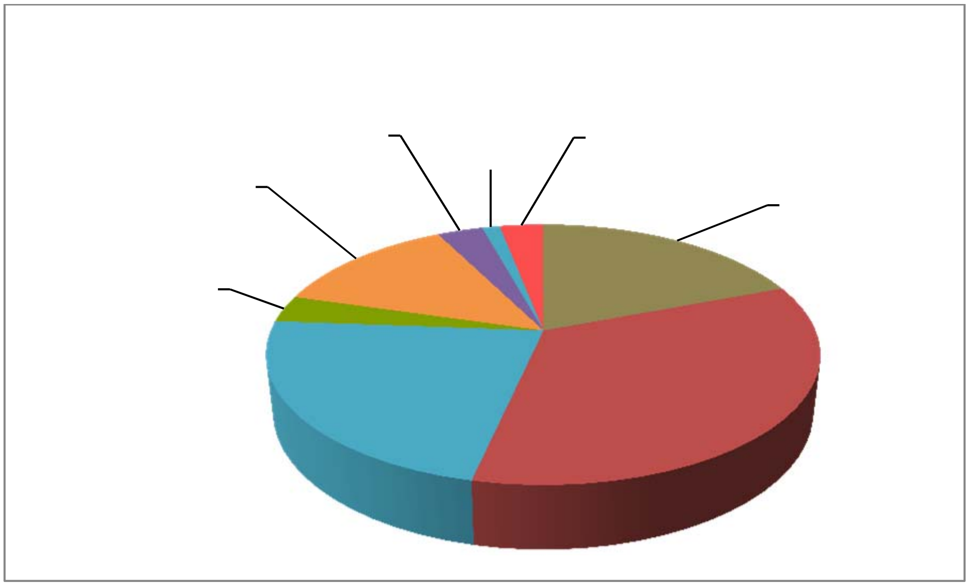
| ECM 5: Roof Replacement | |
|---|---|
| Implementation Cost | $398,199 |
| Annual Energy Cost Savings | $1,872 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **212.8 years** |
| **Expected Useful Life** | **40.0 years** |

## 5. Police Building ECMs

The HVAC system is also the largest energy consumer of the Police Building, using 74% of the building's total energy. The percentage of energy used by each category is very similar to Jail I. Refer to the figure on the next page for a breakdown of the building's energy consumption.

Improving the HVAC system will result in substantial savings since the system uses so much energy. However, the building's lighting and envelope systems should be upgraded before or together with the building's HVAC system to reduce installation costs and optimize the building's performance. HVAC improvements recommended for the Police Building include converting the pumps to variable speed operation and changing the air distribution system to VAV.

The lighting systems in this building are also under maintained, energy inefficient, and utilize dated technologies. The lighting system in the Police Building is the worst of all of the buildings assessed, with T12 lighting fixtures in most areas, a high lighting power density, and no lighting controls for most areas. To remedy these conditions and improve the quality of light, recommended strategies include replacing the existing lighting, optimizing the layout and configuration for energy efficiency and quality of light, and incorporating occupancy sensor control. There are not many areas in the building with access to natural light, so daylight harvesting is not recommended. Savings for energy and maintenance of the lighting system will account for nearly half the costs saved for this building.



The poor envelope conditions in the Police Building result in an increase in the building's heating energy, but the cooling energy is not significantly impacted. Similar to Jail I, repairing the facade results in greater savings and a shorter payback than replacing the windows. The roof should be replaced due to its poor condition, but the energy savings are minimal.

These seven energy conservation measures recommended to improve the building's HVAC, lighting, and envelope were modeled separately in Trane Trace to determine the annual energy cost savings of each upgrade. Each ECM is described below, in order of shortest to longest payback. Refer to Appendix G for detailed cost estimates of each ECM.

### 5.1 ECM-1: Occupancy Sensors

At the Police Building, lights primarily remain on during building operating hours even when spaces are unoccupied. Occupancy sensors are currently not utilized in this building. We recommend installing occupancy sensors in the office areas, conference rooms, recreation rooms, laboratories, storage rooms, laundry room, kitchen, locker rooms, and restrooms. Refer to Occupancy Sensors in Appendix B for more information about this ECM.

This energy conservation measure is relatively inexpensive to implement and has a very short payback of just over a year. The energy savings are significant for this building since the lighting power density is so high and most of the lights are left on continuously.

| ECM 1: Occupancy Sensors | |
|---|---|
| Implementation Cost | $107,855 |
| Annual Energy Cost Savings | $86,697 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **1.2 years** |
| **Expected Useful Life** | **20.0 years** |

## 5.2 ECM-2: LED Lighting Upgrade

We recommend upgrading the areas with high lighting power densities to LED lighting. If all of the lights in the building are upgraded, the first cost will increase and in turn the payback will be slightly longer. Refer to LED Lighting Upgrade in Appendix B for more information about LED technology. The lighting power densities for the existing building and proposed LED lighting upgrades were modeled as follows in the Police Building:

| Space Type | Existing LPD | LED Lighting LPD |
|---|---|---|
| **Conference** | 1.8 W/sf | 0.9 W/sf |
| **Dormitory** | 2.7 W/sf | 0.8 W/sf |
| **Forensic Lab** | 2.7 W/sf | 1.0 W/sf |
| **Holding Cell** | 1.1 W/sf | 0.6 W/sf |
| **Kitchen** | 2.3 W/sf | 0.8 W/sf |
| **Lockers** | 2.4 W/sf | 0.5 W/sf |
| **Office T12s** | 2.8 W/sf | 0.8 W/sf |
| **Office T8s** | 2.2 W/sf | 0.8 W/sf |
| **Recreation** | 2.9 w/sf | 1.0 W/.sf |

For all of the areas except the offices with T8 lights, the lighting power density modeled in the existing building was reduced by 33% to represent lamps in the old T12 fixtures that are not regularly replaced. This energy conservation measure is estimated to reduce the building's annual lighting energy consumption by 42% and the building's cooling energy by 18%.

The energy and maintenance cost savings is significant for this building since the existing system is so inefficient and hard to maintain, resulting in a payback of less than five years. Refer to the table below for a cost breakdown of this ECM.

| ECM 2: LED Lighting Upgrade | |
|---|---|
| Implementation Cost | $1,291,280 |
| Annual Energy Cost Savings | $143,345 |
| Annual Maintenance Savings | $133,109 |
| **Simple Payback Period** | **4.7 years** |
| **Expected Useful Life** | **20.0 years** |

## 5.3 ECM-3: Facade Maintenance

We recommend repairing the sealants and caulk joints between the granite panels and applying water repellents to the stone panels to reduce infiltration. Additional information about this ECM can be found in the Facade Maintenance section in Appendix C.

The energy cost savings for this ECM is substantial and similar to Jail I. This ECM has a simple payback of less than ten years and reduces the building's steam use for space heating by 13%. Refer to the following table for the cost breakdown.

| ECM 3: Façade Maintenance | |
|---|---|
| Implementation Cost | $352,648 |
| Annual Energy Cost Savings | $47,497 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **7.4 years** |
| **Expected Useful Life** | **40.0 years** |

## 5.4 ECM-4: Variable Speed Pumps

The existing heating hot water pumps are configured in a constant flow, primary-secondary arrangement and the chilled water pumps are constant flow, primary only. We recommend removing the secondary heating pumps and adding variable frequency drives to new primary pumps. Refer to Variable Primary Pumps in Appendix A for more information about this ECM.

The new system will utilize primary pumps only and six less pumps will be needed since heating hot water flow will be regulated using modulating control valves. This energy conservation measure is relatively inexpensive to implement compared to some of the other ECMs and results in substantial energy and maintenance cost savings, with a payback of 8.9 years.

| ECM 4: Variable Speed Pumps | |
|---|---|
| Implementation Cost | $365,462 |
| Annual Energy Cost Savings | $31,243 |
| Annual Maintenance Savings | $10,000 |
| **Simple Payback Period** | **8.9 years** |
| **Expected Useful Life** | **40.0 years** |

## 5.5 ECM-5: VAV System Conversion

Two main air handling units serve the Police Building, one unit serving the south side and one unit serving the north side. The units were designed as variable volume with inlet guide vanes and moduline units, but the operation is manually controlled, typically 40% in the winter, 75% in the summer, and 100% at peak load. We recommend converting all of the units to VAV systems with variable frequency drives, removing the moduline units and adding VAV terminal units. The existing radiators can remain, with new control valves added. Refer to VAV System Conversion in Appendix A for more information about this ECM.

Once these air handling units are upgraded to VAV, several advanced controls strategies can be implemented to further optimize the energy performance of the system, including demand control ventilation, critical zone reset, and zone-level HVAC set back. System level setback is not recommended for this building since many areas are occupied continuously on nights and weekends. Refer to the Advanced Controls sections in Appendix A for descriptions of these improvements.

Space heating energy will be reduced by 16%, space cooling energy will be reduced by 40%, and fan energy will be reduced by 37%. This ECM is less expensive to implement than at the other buildings since there are only two air handlers and the ductwork is already sized and zoned appropriately, so the payback is only 12.8 years. Refer to the following table for the cost breakdown.

| ECM 5: VAV with Advanced Controls | |
|---|---|
| Implementation Cost | $3,565,081 |
| Annual Energy Cost Savings | $248,345 |
| Annual Maintenance Savings | $30,000 |
| **Simple Payback Period** | **12.8 years** |
| **Expected Useful Life** | **30.0 years** |

This analysis does not take into account the fact that the existing HVAC system will need to be replaced within five years due to the equipment being at the end of its service life. If the system was replaced in its current form of fourteen air handling units, we estimate the cost to be $11,314,920.

If the system is converted to a complete VAV system, the total system airflow can be reduced by 10% or 10,000 cfm. If all of the energy conservation measures recommended in this Report are implemented, the total system size can be decreased even further by 23,000 more cfm.

### 5.6 ECM-6: Parking Garage LED Lighting

The Police Building garage lighting consists of the original high pressure sodium (HPS) fixtures. The lights are inefficient, expensive to maintain, and provide poor quality lighting. We recommend replacing the HPS lights with LED fixtures. The LED fixtures save electricity, but they also save more money per year in maintenance costs. This ECM has a simple payback of 15.2 years.

| ECM 6: Garage LED Lighting | |
|---|---|
| Implementation Cost | $126,104 |
| Annual Energy Cost Savings | $3,768 |
| Annual Maintenance Savings | $4,547 |
| **Simple Payback Period** | **15.2 years** |
| **Expected Useful Life** | **20.0 years** |

### 5.7 ECM-7: Roof Replacement

We recommend replacing the existing R-14.7 roof with a new R-25 roof. Refer to Roof Replacement in Appendix C for more information about this ECM.

The savings and payback are similar to Jails I & II, being better than the Court Tower but still not enough to make this ECM worthwhile. We recommend replacing the roof when its condition deteriorates enough to warrant replacement, but this upgrade should not be considered solely for energy conservation.

| ECM 7: Roof Replacement | |
|---|---|
| Implementation Cost | $591,627 |
| Annual Energy Cost Savings | $1,232 |
| Annual Maintenance Savings | $0 |
| **Simple Payback Period** | **480.2 years** |
| **Expected Useful Life** | **40.0 years** |

## 6. Water Conservation Measures

The existing plumbing fixtures at the Justice Center complex are outdated and in poor condition. Although many of the fixtures have been replaced since the building was constructed, advances have been made towards more efficient design for water conservation.

Most of the existing water closets at the Court Tower, Atrium, and Police Building have an existing flush rate of 1.6 gallons per flush (gpf). The flush rate can be decreased to 1.28 gpf by upgrading to low flow water closets. Alternatively, dual flush water closets with a high flush rate of 1.6 gpf and a low flush rate of 1.1 gpf could be installed for similar water savings.

The urinals at the Justice Center complex have an existing flush rate of 1.0 gpf. New urinals can be installed with a flush rate of 0.125 gpf, resulting in 87.5% water savings. These urinals would be a significant improvement over the existing equipment.

Most of the lavatories at the Court Tower, Atrium, and Police Building have an existing flow rate of 2.2 gallons per minute (gpm). The flow rate can be decreased to 0.5 gpm by upgrading to low flow lavatories. Automatic controls could also be installed on the lavatories, but this will increase the installed cost and annual maintenance costs.

Water savings was calculated using the following utilization assumptions for full time equivalent occupants (employees) and transient occupants (jurors, visitors):

| Occupant Type | Occupant Ratio | | Daily Water Closet Uses | | Daily Urinal Uses | Daily Lavatory Uses | |
|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Male | Female |
| Full Time | 50% | 50% | 1.0 | 3.0 | 2.0 | 3.0 | 3.0 |
| Transient | 50% | 50% | 0.2 | 0.5 | 0.3 | 0.5 | 0.5 |

Half of the full time equivalent employees working in the Police Building we assumed to work 24 hours per day, 7 days per week, comprised of multiple shifts. Fixtures in jail cells and prisoner areas were not included in the analysis. Upgrading these fixtures to security grade fixtures will be more expensive, increasing the payback. Since there are minimal non-security fixtures in Jail I and Jail II, these two buildings were not considered for upgrades.

In addition to saving water, money will also be saved by reducing maintenance costs for maintaining the fixtures. We estimate this cost to be an average of 15 minutes per year, at $65 per hour, for repairing each existing plumbing fixture. Replacing the water closets, urinals, and lavatories in the Court Tower, Atrium, and Police Building with water savings fixtures results in a total annual savings of $59,428 and a simple **payback of 19.2 years**.

| Building | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | Metrics | |
|---|---|---|---|---|---|---|
| | | Water / Sewer (mcf) | Water / Sewer Cost Savings | Maintenance Cost Savings | Expected Useful Life | Simple Payback Period (SPP) |
| Court Tower | $841,956 | 238 | $21,275 | $10,741 | 30 | 26.3 |
| Atrium | $33,618 | 28 | $2,515 | $406 | 30 | 11.5 |
| Police | $265,550 | 238 | $21,208 | $3,283 | 30 | 10.8 |
| **Total** | **$1,141,124** | **504** | **$44,998** | **$14,430** | **30** | **19.2** |

## 6.1. Court Tower Water

There are a total of 1,153 full time employees working in the Court Tower during the weekdays. The total number of transient visitors is estimated to be 3,176 people. The total number of non-security grade fixtures in the building eligible for upgrade is 295 water closets, 54 urinals, and 312 lavatories. Using this data and the utilization rates listed above, the annual savings of upgrading the Court Tower with water savings fixtures is $32,016 per year, with a simple payback of 26.3 years.

| Court Tower Fixtures | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | Metrics | |
|---|---|---|---|---|---|---|
| | | Water / Sewer (mcf) | Water / Sewer Cost Savings | Maintenance Cost Savings | Expected Useful Life | Simple Payback Period (SPP) |
| Lavatories | $297,860 | 150 | $13,346 | $5,070 | 30 | 16.2 |
| Urinals | $91,256 | 51 | $4,580 | $878 | 30 | 16.7 |
| Water Closets | $452,841 | 38 | $3,350 | $4,794 | 30 | 55.6 |
| **Total** | **$841,956** | **238** | **$21,275** | **$10,741** | **30** | **26.3** |

## 6.2. Atrium Water

There are a total of 99 full time employees working in the Atrium during the weekdays. The total number of transient visitors is estimated to be 599 people. The total number of non-security grade fixtures in the building eligible for upgrade is 13 water closets, 3 urinals, and 9 lavatories. Using this data and the utilization rates listed above, the annual savings of upgrading the Atrium with water savings fixtures is $2,921 per year, with a simple payback of 11.5 years.

| Atrium Fixtures | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | Metrics | |
|---|---|---|---|---|---|---|
| | | Water / Sewer (mcf) | Water / Sewer Cost Savings | Maintenance Cost Savings | Expected Useful Life | Simple Payback Period (SPP) |
| Lavatories | $8,592 | 18 | $1,577 | $146 | 30 | 5.0 |
| Urinals | $5,070 | 6 | $541 | $49 | 30 | 8.6 |
| Water Closets | $19,956 | 4 | $396 | $211 | 30 | 32.9 |
| **Total** | **$33,618** | **28** | **$2,515** | **$406** | **30** | **11.5** |



### 6.3. Police Building Water

There are a total of 592 full time employees working in the Police Building all week, 24 hours per day. The total number of transient visitors is estimated to be 83 people. The total number of non-security grade fixtures in the building eligible for upgrade is 86 water closets, 31 urinals, and 85 lavatories. Using this data and the utilization rates listed above, the annual savings of upgrading the Police Building with water savings fixtures is $24,491 per year, with a simple payback of 10.8 years.

| Police Building Fixtures | Rough Order of Magnitude (ROM) First Cost | Annual Savings | | | Metrics | |
|---|---|---|---|---|---|---|
| | | Water / Sewer (mcf) | Water / Sewer Cost Savings | Maintenance Cost Savings | Expected Useful Life | Simple Payback Period (SPP) |
| Lavatories | $81,148 | 149 | $13,304 | $1,381 | 30 | 5.5 |
| Urinals | $52,387 | 51 | $4,565 | $504 | 30 | 10.3 |
| Water Closets | $132,015 | 37 | $3,339 | $1,398 | 30 | 27.9 |
| **Total** | **$265,550** | **238** | **$21,208** | **$3,283** | **30** | **10.8** |

## 7. Lifecycle Costs

Evaluating the simple payback period of implementing the energy conservation measures assumes that the value of money remains the same over the payback period. In reality, costs of equipment, maintenance services, and utilities increases with inflation. Life cycle cost analysis is a method of economic analysis for all costs related to building, operating, and maintaining a project over a defined period of time. Assumed escalation rates are used to account for increases in utility costs over time. Future costs are expressed in present day dollars by applying a discount rate. All costs and savings can then be directly compared and fully-informed decisions can be made. The life cycle cost analysis compared the cost of maintaining the existing building systems and replacing in kind against performing the recommended upgrades in order to optimize energy and maintenance savings. The following parameters were used for the lifecycle cost analysis:

- Lifecycle cost time period: 20 years
- Inflation rate of labor: 3%
- Inflation rate of materials: 3%
- Inflation rate of utility costs: 3%
- Interest rate of finance: 4% (discount rate)

The lifecycle cost analysis was performed directly in Trane Trace along with the energy modeling. The complete energy usage of each building, existing and with ECMs implemented, was assessed. For equipment and maintenance costs, only the differences in costs between the two buildings were included in the analysis, not the complete operational costs. These costs include:

- Energy Cost: Complete energy costs, including chilled water, steam, and electricity.

- Water/Sewer Cost: Complete water and sewer costs for each building.

- Interest Cost: Amount paid in interest to finance energy and water conservation measures at 4% APR.

- Principal Cost: Amount paid in principal financed to implement energy and water conservation measures.

- HVAC Maintenance Cost: Labor and benefit cost avoidance for hiring three additional maintenance staff in order to properly maintain the deteriorating systems in the existing buildings. The labor and benefit cost avoidance savings was split between the four buildings with two in the Court Tower and one splitting time between the two jails and Police Building. Also, labor and materials needed to maintain existing equipment, such as air handlers and pumps, that is removed as part of the energy conservation measures and no longer needs maintenance after the ECMs are implemented. Includes difference in costs only for the systems evaluated, not maintenance costs for the whole building.

- Lighting Maintenance Cost: Labor and materials needed to replace lamps and ballasts for the fluorescent and HPS fixtures in the existing building and labor and materials needed to replace the drivers on LED fixtures after the ECMs have been implemented. Includes costs for only the fixtures replaced as part of the ECM, not all of the lighting fixtures in the entire building.

- Plumbing Maintenance Cost: Labor needed to repair existing old plumbing fixtures.

All other costs associated with the building, including other staff, other maintenance costs, and construction costs for unrelated projects are not included in the assessment. The lifecycle cost of each building was determined separately in Trane Trace over a time period of 20 years.

### 7.1. Court Tower / Atrium Lifecycle

The lifecycle cost of the existing Court Tower/Atrium building complex was assessed for a time period of 20 years. The maintenance costs of the existing building were estimated to be as follows:

- Two staff to maintain deteriorating system: $180,000 per year (up to year 5)
- One-for-one replacement of HVAC system: $21,342,450 at year 5
- Maintenance for four induction air handlers: $40,000 per year
- Maintenance for 38 secondary HVAC pumps: $50,000 per year
- Replacing fluorescent light lamps and ballasts: $1,369,285 every 6 years
- Replacing garage HPS lamps and ballasts: $42,206 every 2 years
- Repairing existing plumbing fixtures: $11,148 per year

Refer to the following table for the cash flow of the existing Court Tower/Atrium building complex, which has a **lifecycle cost of $45,712,476** over a time period of 20 years.

| | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $1,954,172 | $542,808 | $0 | $0 | $270,000 | $0 | $11,148 | $2,778,129 | $2,525,571 |
| 2 | $2,012,797 | $559,093 | $0 | $0 | $278,100 | $1,453,836 | $11,482 | $4,315,308 | $3,566,370 |
| 3 | $2,073,181 | $575,865 | $0 | $0 | $286,443 | $0 | $11,827 | $2,947,317 | $2,214,362 |
| 4 | $2,135,377 | $593,141 | $0 | $0 | $295,036 | $46,120 | $12,182 | $3,081,856 | $2,104,949 |
| 5 | $2,199,438 | $610,936 | $0 | $0 | $24,122,409 | $0 | $12,547 | $26,945,331 | $16,730,929 |
| 6 | $2,265,421 | $629,264 | $0 | $0 | $104,335 | $48,928 | $12,924 | $3,060,871 | $1,727,782 |
| 7 | $2,333,384 | $648,141 | $0 | $0 | $107,465 | $0 | $13,311 | $3,102,301 | $1,591,971 |
| 8 | $2,403,385 | $667,586 | $0 | $0 | $110,688 | $1,735,956 | $13,711 | $4,931,326 | $2,300,499 |
| 9 | $2,475,487 | $687,613 | $0 | $0 | $114,009 | $0 | $14,122 | $3,291,231 | $1,395,803 |
| 10 | $2,549,751 | $708,242 | $0 | $0 | $117,430 | $55,069 | $14,546 | $3,445,037 | $1,328,211 |
| 11 | $2,626,244 | $729,489 | $0 | $0 | $120,952 | $0 | $14,982 | $3,491,667 | $1,223,808 |
| 12 | $2,705,031 | $751,374 | $0 | $0 | $124,581 | $58,423 | $15,431 | $3,654,840 | $1,164,544 |
| 13 | $2,786,182 | $773,915 | $0 | $0 | $128,318 | $0 | $15,894 | $3,704,310 | $1,073,006 |
| 14 | $2,869,767 | $797,132 | $0 | $0 | $132,168 | $2,072,822 | $16,371 | $5,888,261 | $1,550,563 |
| 15 | $2,955,861 | $821,046 | $0 | $0 | $136,133 | $0 | $16,862 | $3,929,902 | $940,787 |
| 16 | $3,044,536 | $845,678 | $0 | $0 | $140,216 | $65,756 | $17,368 | $4,113,555 | $895,229 |
| 17 | $3,135,872 | $871,048 | $0 | $0 | $144,424 | $0 | $17,889 | $4,169,233 | $824,860 |
| 18 | $3,229,949 | $897,179 | $0 | $0 | $148,757 | $69,760 | $18,426 | $4,364,070 | $784,916 |
| 19 | $3,326,847 | $924,095 | $0 | $0 | $153,219 | $0 | $18,979 | $4,423,139 | $723,218 |
| 20 | $3,426,652 | $951,818 | $0 | $0 | $157,815 | $2,475,058 | $19,548 | $7,030,891 | $1,045,097 |
| **Total** | **$52,509,336** | **$14,585,461** | **$0** | **$0** | **$27,192,499** | **$8,081,728** | **$299,551** | **$102,668,575** | **$45,712,476** |

The lifecycle cost of the Court Tower/Atrium building complex with all nine energy conservation measures was assessed for the same time period of 20 years. Equipment and maintenance costs for renovated building were estimated to be as follows:

- Construction cost of implementing ECMs: $33,113,238 financed over 20 years
- Replacing LED lighting fixture drivers: $706,194 every 5 years

The new HVAC and plumbing systems are anticipated to need less maintenance than the existing systems, so no additional maintenance costs were considered for the building with ECMs implemented. Refer to the table below for the cash flow of the Court Tower/Atrium building complex with all nine energy conservation measures, which has a **lifecycle cost of $37,573,791** over a time period of 20 years.

| | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $915,709 | $518,981 | $1,359,552 | $1,141,405 | $0 | $0 | $0 | $3,935,647 | $3,577,861 |
| 2 | $943,180 | $534,550 | $1,313,896 | $1,187,061 | $0 | $0 | $0 | $3,978,688 | $3,288,171 |
| 3 | $971,475 | $550,587 | $1,266,414 | $1,234,543 | $0 | $0 | $0 | $4,023,019 | $3,022,554 |
| 4 | $1,000,620 | $567,104 | $1,217,032 | $1,283,925 | $0 | $0 | $0 | $4,068,681 | $2,778,964 |
| 5 | $1,030,638 | $584,117 | $1,165,675 | $1,335,282 | $0 | $794,828 | $0 | $4,910,541 | $3,049,059 |
| 6 | $1,061,557 | $601,641 | $1,112,264 | $1,388,693 | $0 | $0 | $0 | $4,164,156 | $2,350,557 |
| 7 | $1,093,404 | $619,690 | $1,056,716 | $1,444,241 | $0 | $0 | $0 | $4,214,052 | $2,162,474 |
| 8 | $1,126,206 | $638,281 | $998,946 | $1,502,011 | $0 | $0 | $0 | $4,265,444 | $1,989,861 |
| 9 | $1,159,992 | $657,429 | $938,866 | $1,562,091 | $0 | $0 | $0 | $4,318,379 | $1,831,414 |
| 10 | $1,194,792 | $677,152 | $876,382 | $1,624,575 | $0 | $921,423 | $0 | $5,294,325 | $2,041,191 |
| 11 | $1,230,636 | $697,467 | $811,399 | $1,689,558 | $0 | $0 | $0 | $4,429,060 | $1,552,358 |
| 12 | $1,267,555 | $718,391 | $743,817 | $1,757,140 | $0 | $0 | $0 | $4,486,903 | $1,429,665 |
| 13 | $1,305,582 | $739,942 | $673,531 | $1,827,426 | $0 | $0 | $0 | $4,546,481 | $1,316,953 |
| 14 | $1,344,749 | $762,141 | $600,434 | $1,900,523 | $0 | $0 | $0 | $4,607,847 | $1,213,390 |
| 15 | $1,385,092 | $785,005 | $524,413 | $1,976,544 | $0 | $1,068,182 | $0 | $5,739,235 | $1,373,927 |
| 16 | $1,426,644 | $808,555 | $445,352 | $2,055,606 | $0 | $0 | $0 | $4,736,157 | $1,030,725 |
| 17 | $1,469,444 | $832,812 | $363,127 | $2,137,830 | $0 | $0 | $0 | $4,803,213 | $950,290 |
| 18 | $1,513,527 | $857,796 | $277,614 | $2,223,343 | $0 | $0 | $0 | $4,872,280 | $876,322 |
| 19 | $1,558,933 | $883,530 | $188,681 | $2,312,277 | $0 | $0 | $0 | $4,943,420 | $808,288 |
| 20 | $1,605,701 | $910,036 | $96,190 | $2,404,768 | $0 | $1,238,315 | $0 | $6,255,009 | $929,767 |
| **Total** | **$24,605,437** | **$13,945,207** | **$16,030,303** | **$33,988,842** | **$0** | **$4,022,747** | **$0** | **$92,592,536** | **$37,573,791** |

The **lifecycle cost savings for the proposed ECMs is $8,138,685** over a period of 20 years for the Court Tower/Atrium building complex.

## 7.2. Jail I Lifecycle

The lifecycle cost of the existing Jail I building was assessed for a time period of 20 years. The maintenance costs of the existing building were estimated to be as follows:

- 1/3 staff to maintain deteriorating system: $30,000 per year (up to year 5)
- One-for-one replacement of HVAC system: $15,964,440 at year 5
- Maintenance for two induction air handlers: $20,000 per year
- Maintenance for 24 secondary HVAC pumps: $30,000 per year
- Replacing fluorescent light lamps and ballasts: $1,185,627 every 6 years
- Replacing garage HPS lamps and ballasts: $16,808 every 2 years

Refer to the table below for the cash flow of the existing Jail I building, which has a **lifecycle cost of $33,578,682** over a time period of 20 years.

| | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $1,661,915 | $180,901 | $0 | $0 | $80,000 | $0 | $0 | $1,922,816 | $1,748,015 |
| 2 | $1,711,772 | $186,328 | $0 | $0 | $82,400 | $1,238,508 | $0 | $3,219,009 | $2,660,338 |
| 3 | $1,763,125 | $191,918 | $0 | $0 | $84,872 | $0 | $0 | $2,039,916 | $1,532,619 |
| 4 | $1,816,019 | $197,676 | $0 | $0 | $87,418 | $18,367 | $0 | $2,119,480 | $1,447,633 |
| 5 | $1,870,500 | $203,606 | $0 | $0 | $18,024,393 | $0 | $0 | $20,098,499 | $12,479,586 |
| 6 | $1,926,615 | $209,714 | $0 | $0 | -$19,485 | $19,485 | $0 | $2,213,778 | $1,249,620 |
| 7 | $1,984,413 | $216,006 | $0 | $0 | $0 | $0 | $0 | $2,260,121 | $1,159,799 |
| 8 | $2,043,946 | $222,486 | $0 | $0 | -$1,478,843 | $1,478,843 | $0 | $3,806,768 | $1,775,885 |
| 9 | $2,105,264 | $229,160 | $0 | $0 | $0 | $0 | $0 | $2,397,763 | $1,016,885 |
| 10 | $2,168,422 | $236,035 | $0 | $0 | -$21,931 | $21,931 | $0 | $2,491,626 | $960,630 |
| 11 | $2,233,475 | $243,116 | $0 | $0 | $0 | $0 | $0 | $2,543,787 | $891,581 |
| 12 | $2,300,479 | $250,410 | $0 | $0 | -$21,931 | $21,931 | $0 | $2,643,366 | $842,258 |
| 13 | $2,369,493 | $257,922 | $0 | $0 | $0 | $0 | $0 | $2,698,703 | $781,718 |
| 14 | $2,440,578 | $265,660 | $0 | $0 | -$1,765,816 | $1,765,816 | $0 | $4,545,480 | $1,196,967 |
| 15 | $2,513,795 | $273,629 | $0 | $0 | $0 | $0 | $0 | $2,863,054 | $685,392 |
| 16 | $2,589,209 | $281,838 | $0 | $0 | -$26,186 | $26,186 | $0 | $2,975,132 | $647,475 |
| 17 | $2,666,885 | $290,293 | $0 | $0 | $0 | $0 | $0 | $3,037,414 | $600,936 |
| 18 | $2,746,892 | $299,002 | $0 | $0 | -$27,781 | $27,781 | $0 | $3,156,317 | $567,691 |
| 19 | $2,829,299 | $307,972 | $0 | $0 | $0 | $0 | $0 | $3,222,392 | $526,887 |
| 20 | $2,914,177 | $317,211 | $0 | $0 | -$2,108,477 | $2,108,477 | $0 | $5,427,541 | $806,769 |
| **Total** | **$44,656,272** | **$4,860,885** | **$0** | **$0** | **$4,860,885** | **$6,727,325** | **$0** | **$75,682,962** | **$33,578,682** |

The lifecycle cost of the Jail I building with all eight energy conservation measures was assessed for the same time period of 20 years. Equipment and maintenance costs for renovated building were estimated to be as follows:

- Construction cost of implementing ECMs: $11,339,498789 financed over 20 years
- Replacing LED lighting fixture drivers: $599,088 every 5 years

The new HVAC system is anticipated to need less maintenance than the existing HVAC system, so no additional maintenance costs were considered for the building with ECMs implemented. Refer to the table below for the cash flow of the Jail I building with all eight energy conservation measures, which has a **lifecycle cost of $20,692,120** over a time period of 20 years.

| | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $1,012,301 | $180,901 | $455,235 | $382,190 | $0 | $0 | $0 | $2,030,627 | $1,846,025 |
| 2 | $1,042,670 | $186,328 | $439,947 | $397,478 | $0 | $0 | $0 | $2,066,423 | $1,707,788 |
| 3 | $1,073,950 | $191,918 | $424,048 | $413,377 | $0 | $0 | $0 | $2,103,293 | $1,580,235 |
| 4 | $1,106,169 | $197,676 | $407,513 | $429,912 | $0 | $0 | $0 | $2,141,269 | $1,462,516 |
| 5 | $1,139,354 | $203,606 | $390,317 | $447,108 | $0 | $674,279 | $0 | $2,854,664 | $1,772,521 |
| 6 | $1,173,534 | $209,714 | $372,432 | $464,993 | $0 | $0 | $0 | $2,220,673 | $1,253,512 |
| 7 | $1,208,741 | $216,006 | $353,833 | $483,592 | $0 | $0 | $0 | $2,262,171 | $1,160,851 |
| 8 | $1,245,003 | $222,486 | $334,489 | $502,936 | $0 | $0 | $0 | $2,304,913 | $1,075,259 |
| 9 | $1,282,353 | $229,160 | $314,371 | $523,053 | $0 | $0 | $0 | $2,348,938 | $996,179 |
| 10 | $1,320,823 | $236,035 | $293,449 | $543,975 | $0 | $781,674 | $0 | $3,175,957 | $1,224,469 |
| 11 | $1,360,448 | $243,116 | $271,690 | $565,734 | $0 | $0 | $0 | $2,440,989 | $855,552 |
| 12 | $1,401,261 | $250,410 | $249,061 | $588,364 | $0 | $0 | $0 | $2,489,096 | $793,102 |
| 13 | $1,443,299 | $257,922 | $225,526 | $611,898 | $0 | $0 | $0 | $2,538,646 | $735,355 |
| 14 | $1,486,598 | $265,660 | $201,050 | $636,374 | $0 | $0 | $0 | $2,589,683 | $681,944 |
| 15 | $1,531,196 | $273,629 | $175,595 | $661,829 | $0 | $906,174 | $0 | $3,548,425 | $849,464 |
| 16 | $1,577,132 | $281,838 | $149,122 | $688,302 | $0 | $0 | $0 | $2,696,395 | $586,814 |
| 17 | $1,624,446 | $290,293 | $121,590 | $715,835 | $0 | $0 | $0 | $2,752,164 | $544,501 |
| 18 | $1,673,179 | $299,002 | $92,957 | $744,468 | $0 | $0 | $0 | $2,809,606 | $505,332 |
| 19 | $1,723,375 | $307,972 | $63,178 | $774,247 | $0 | $0 | $0 | $2,868,772 | $469,067 |
| 20 | $1,775,076 | $317,211 | $32,208 | $805,217 | $0 | $1,050,504 | $0 | $3,980,217 | $591,634 |
| **Total** | **$27,200,911** | **$4,860,885** | **$5,367,614** | **$11,380,882** | **$0** | **$3,412,631** | **$0** | **$52,222,923** | **$20,692,120** |

The **lifecycle cost difference for the proposed ECMs is $12,886,563** over a period of 20 years for the Jail I building.

## 7.3. Jail II Lifecycle

The lifecycle cost of the existing Jail II building was assessed for a time period of 20 years. The maintenance costs of the existing building were estimated to be as follows:

- 1/3 staff to maintain deteriorating system: $30,000 per year (up to year 5)
- One-for-one replacement of HVAC system: $6,785,670 at year 5
- Maintenance for nine multi-zone air handlers: $50,000 per year
- Replacing fluorescent light lamps and ballasts: $314,304 every 6 years

Refer to the table below for the cash flow of the existing Jail II building, which has a **lifecycle cost of $18,189,946** over a time period of 20 years.

| | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $703,810 | $461,189 | $0 | $0 | $80,000 | $0 | $0 | $1,244,999 | $1,131,817 |
| 2 | $724,924 | $475,024 | $0 | $0 | $82,400 | $323,733 | $0 | $1,606,082 | $1,327,340 |
| 3 | $746,672 | $489,275 | $0 | $0 | $84,872 | $0 | $0 | $1,320,819 | $992,351 |
| 4 | $769,072 | $503,953 | $0 | $0 | $87,418 | $0 | $0 | $1,360,444 | $929,201 |
| 5 | $792,144 | $519,072 | $0 | $0 | $7,693,607 | $0 | $0 | $9,004,823 | $5,591,286 |
| 6 | $815,909 | $534,644 | $0 | $0 | $57,964 | $0 | $0 | $1,408,516 | $795,071 |
| 7 | $840,386 | $550,683 | $0 | $0 | $59,702 | $0 | $0 | $1,450,772 | $744,475 |
| 8 | $865,598 | $567,204 | $0 | $0 | $61,494 | $386,554 | $0 | $1,880,849 | $877,430 |
| 9 | $891,566 | $584,220 | $0 | $0 | $63,339 | $0 | $0 | $1,539,124 | $652,739 |
| 10 | $918,312 | $601,746 | $0 | $0 | $65,239 | $0 | $0 | $1,585,298 | $611,201 |
| 11 | $945,862 | $619,799 | $0 | $0 | $67,196 | $0 | $0 | $1,632,856 | $572,306 |
| 12 | $974,238 | $638,393 | $0 | $0 | $69,212 | $0 | $0 | $1,681,842 | $535,887 |
| 13 | $1,003,465 | $657,545 | $0 | $0 | $71,288 | $0 | $0 | $1,732,297 | $501,785 |
| 14 | $1,033,569 | $677,271 | $0 | $0 | $73,427 | $461,566 | $0 | $2,245,832 | $591,398 |
| 15 | $1,064,576 | $697,589 | $0 | $0 | $75,629 | $0 | $0 | $1,837,794 | $439,953 |
| 16 | $1,096,513 | $718,517 | $0 | $0 | $77,898 | $0 | $0 | $1,892,928 | $411,956 |
| 17 | $1,129,408 | $740,072 | $0 | $0 | $80,236 | $0 | $0 | $1,949,716 | $385,741 |
| 18 | $1,163,291 | $762,274 | $0 | $0 | $82,643 | $0 | $0 | $2,008,207 | $361,194 |
| 19 | $1,198,189 | $785,143 | $0 | $0 | $85,122 | $0 | $0 | $2,068,454 | $338,209 |
| 20 | $1,234,135 | $808,697 | $0 | $0 | $87,675 | $551,134 | $0 | $2,681,641 | $398,609 |
| **Total** | **$18,911,639** | **$12,392,307** | **$0** | **$0** | **$9,106,360** | **$1,722,987** | **$0** | **$42,133,292** | **$18,189,946** |

The lifecycle cost of the Jail II building with all five energy conservation measures was assessed for the same time period of 20 years. Equipment and maintenance costs for renovated building were estimated to be as follows:

- Construction cost of implementing ECMs: $5,067,682 financed over 20 years
- Replacing LED lighting fixture drivers: $197,002 every 5 years

The new HVAC system is anticipated to need less maintenance than the existing HVAC system, so no additional maintenance costs were considered for the building with ECMs implemented. Refer to the table below for the cash flow of the Jail II building with all five energy conservation measures, which has a **lifecycle cost of $13,552,869** over a time period of 20 years.

| Year | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $497,505 | $461,189 | $202,707 | $170,182 | $0 | $0 | $0 | $1,331,582 | $1,210,529 |
| 2 | $512,430 | $475,024 | $195,900 | $176,989 | $0 | $0 | $0 | $1,360,343 | $1,124,251 |
| 3 | $527,803 | $489,275 | $188,820 | $184,069 | $0 | $0 | $0 | $1,389,967 | $1,044,303 |
| 4 | $543,637 | $503,953 | $181,458 | $191,431 | $0 | $0 | $0 | $1,420,479 | $970,206 |
| 5 | $559,946 | $519,072 | $173,800 | $199,089 | $0 | $221,727 | $0 | $1,673,634 | $1,039,195 |
| 6 | $576,744 | $534,644 | $165,837 | $207,052 | $0 | $0 | $0 | $1,484,277 | $837,836 |
| 7 | $594,047 | $550,683 | $157,555 | $215,334 | $0 | $0 | $0 | $1,517,619 | $778,778 |
| 8 | $611,868 | $567,204 | $148,941 | $223,948 | $0 | $0 | $0 | $1,551,961 | $724,001 |
| 9 | $630,224 | $584,220 | $139,984 | $232,906 | $0 | $0 | $0 | $1,587,333 | $673,184 |
| 10 | $649,131 | $601,746 | $130,667 | $242,222 | $0 | $257,043 | $0 | $1,880,809 | $725,133 |
| 11 | $668,605 | $619,799 | $120,978 | $251,911 | $0 | $0 | $0 | $1,661,293 | $582,273 |
| 12 | $688,663 | $638,393 | $110,902 | $261,987 | $0 | $0 | $0 | $1,699,945 | $541,655 |
| 13 | $709,323 | $657,545 | $100,423 | $272,467 | $0 | $0 | $0 | $1,739,756 | $503,945 |
| 14 | $730,602 | $677,271 | $89,524 | $283,365 | $0 | $0 | $0 | $1,780,762 | $468,930 |
| 15 | $752,521 | $697,589 | $78,189 | $294,700 | $0 | $297,983 | $0 | $2,120,982 | $507,746 |
| 16 | $775,096 | $718,517 | $66,401 | $306,488 | $0 | $0 | $0 | $1,866,502 | $406,205 |
| 17 | $798,349 | $740,072 | $54,142 | $318,747 | $0 | $0 | $0 | $1,911,310 | $378,142 |
| 18 | $822,300 | $762,274 | $41,392 | $331,497 | $0 | $0 | $0 | $1,957,463 | $352,067 |
| 19 | $846,969 | $785,143 | $28,132 | $344,757 | $0 | $0 | $0 | $2,005,000 | $327,833 |
| 20 | $872,378 | $808,697 | $14,342 | $358,547 | $0 | $345,444 | $0 | $2,399,408 | $356,656 |
| **Total** | **$13,368,139** | **$12,392,307** | **$2,390,095** | **$5,067,686** | **$0** | **$1,122,198** | **$0** | **$34,340,426** | **$13,552,869** |

The **lifecycle cost savings for the proposed ECMs is $4,637,077** over a period of 20 years for the Jail II building.

## 7.4. Police Building Lifecycle

The lifecycle cost of the existing Police Building was assessed for a time period of 20 years. The maintenance costs of the existing building were estimated to be as follows:

- 1/3 staff to maintain deteriorating system: $30,000 per year (up to year 5)
- One-for-one replacement of HVAC system: $11,314,920 at year 5
- Maintenance for 6 secondary HVAC pumps: $10,000 per year
- Replacing fluorescent light lamps and ballasts: $1,105,914 every 6 years
- Replacing garage HPS lamps and ballasts: $18,810 every 2 years
- Repairing existing plumbing fixtures: $3,283 per year

Refer to the table below for the cash flow of the existing Police Building, which has a **lifecycle cost of $24,679,297** over a time period of 20 years.

| | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $1,131,853 | $221,868 | $0 | $0 | $40,000 | $0 | $3,283 | $1,397,004 | $1,270,004 |
| 2 | $1,165,809 | $228,524 | $0 | $0 | $41,200 | $1,158,466 | $3,381 | $2,597,380 | $2,146,595 |
| 3 | $1,200,783 | $235,380 | $0 | $0 | $42,436 | $0 | $3,483 | $1,482,082 | $1,113,510 |
| 4 | $1,236,807 | $242,441 | $0 | $0 | $43,709 | $20,554 | $3,587 | $1,547,098 | $1,056,689 |
| 5 | $1,273,911 | $249,714 | $0 | $0 | $12,746,297 | $0 | $3,695 | $14,273,617 | $8,862,793 |
| 6 | $1,312,128 | $257,206 | $0 | $0 | $11,593 | $21,806 | $3,806 | $1,606,538 | $906,849 |
| 7 | $1,351,492 | $264,922 | $0 | $0 | $11,940 | $0 | $3,920 | $1,632,274 | $837,615 |
| 8 | $1,392,037 | $272,870 | $0 | $0 | $12,298 | $1,383,269 | $4,038 | $3,064,511 | $1,429,617 |
| 9 | $1,433,798 | $281,056 | $0 | $0 | $12,668 | $0 | $4,159 | $1,731,680 | $734,401 |
| 10 | $1,476,812 | $289,487 | $0 | $0 | $13,048 | $24,543 | $4,284 | $1,808,173 | $697,129 |
| 11 | $1,521,116 | $298,172 | $0 | $0 | $13,440 | $0 | $4,412 | $1,837,139 | $643,906 |
| 12 | $1,566,750 | $307,117 | $0 | $0 | $13,842 | $26,037 | $4,544 | $1,918,291 | $611,226 |
| 13 | $1,613,752 | $316,331 | $0 | $0 | $14,257 | $0 | $4,681 | $1,949,021 | $564,562 |
| 14 | $1,662,165 | $325,821 | $0 | $0 | $14,685 | $1,651,695 | $4,821 | $3,659,186 | $963,578 |
| 15 | $1,712,030 | $335,595 | $0 | $0 | $15,126 | $0 | $4,966 | $2,067,716 | $494,995 |
| 16 | $1,763,390 | $345,663 | $0 | $0 | $15,580 | $29,305 | $5,115 | $2,159,053 | $469,873 |
| 17 | $1,816,292 | $356,033 | $0 | $0 | $16,047 | $0 | $5,268 | $2,193,640 | $434,000 |
| 18 | $1,870,781 | $366,714 | $0 | $0 | $16,529 | $31,090 | $5,426 | $2,290,539 | $411,973 |
| 19 | $1,926,904 | $377,715 | $0 | $0 | $17,024 | $0 | $5,589 | $2,327,233 | $380,521 |
| 20 | $1,984,711 | $389,047 | $0 | $0 | $17,535 | $1,972,210 | $5,757 | $4,369,260 | $649,462 |
| **Total** | **$30,413,320** | **$5,961,674** | **$0** | **$0** | **$13,129,255** | **$6,318,975** | **$88,215** | **$55,911,439** | **$24,679,297** |

The lifecycle cost of the Police Building with all seven energy conservation measures was assessed for the same time period of 20 years. Equipment and maintenance costs for renovated building were estimated to be as follows:

- Construction cost of implementing ECMs: $6,400,057 financed over 20 years
- Replacing LED lighting fixture drivers: $464,656 every 5 years

The new HVAC and plumbing systems are anticipated to need less maintenance than the existing systems, so no additional maintenance costs were considered for the building with ECMs implemented. Refer to the table below for the cash flow of the Police Building with all seven energy conservation measures, which has a **lifecycle cost of $13,517,005** over a time period of 20 years.

| Year | Annual Costs | | | | | | | Annual Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|
| | Energy Cost | Water/Sewer Cost | Interest Cost | Principal Cost | HVAC Maintenance Cost | Lighting Maintenance Cost | Plumbing Maintenance Cost | Cash Flow Effect | Present Value |
| 1 | $612,090 | $200,653 | $266,624 | $223,843 | $0 | $0 | $0 | $1,303,210 | $1,184,737 |
| 2 | $630,453 | $206,673 | $257,671 | $232,797 | $0 | $0 | $0 | $1,327,593 | $1,097,184 |
| 3 | $649,366 | $212,873 | $248,359 | $242,109 | $0 | $0 | $0 | $1,352,706 | $1,016,308 |
| 4 | $668,847 | $219,259 | $238,674 | $251,793 | $0 | $0 | $0 | $1,378,574 | $941,584 |
| 5 | $688,913 | $225,837 | $228,603 | $261,865 | $0 | $522,974 | $0 | $1,928,191 | $1,197,255 |
| 6 | $709,580 | $232,612 | $218,128 | $272,339 | $0 | $0 | $0 | $1,432,659 | $808,699 |
| 7 | $730,868 | $239,590 | $207,234 | $283,233 | $0 | $0 | $0 | $1,460,925 | $749,685 |
| 8 | $752,794 | $246,778 | $195,905 | $294,562 | $0 | $0 | $0 | $1,490,039 | $695,114 |
| 9 | $775,377 | $254,181 | $184,123 | $306,345 | $0 | $0 | $0 | $1,520,026 | $644,639 |
| 10 | $798,639 | $261,807 | $171,869 | $318,598 | $0 | $606,271 | $0 | $2,157,183 | $831,687 |
| 11 | $822,598 | $269,661 | $159,125 | $331,342 | $0 | $0 | $0 | $1,582,726 | $554,736 |
| 12 | $847,276 | $277,751 | $145,871 | $344,596 | $0 | $0 | $0 | $1,615,494 | $514,746 |
| 13 | $872,694 | $286,083 | $132,087 | $358,380 | $0 | $0 | $0 | $1,649,245 | $477,727 |
| 14 | $898,875 | $294,666 | $117,752 | $372,715 | $0 | $0 | $0 | $1,684,008 | $443,452 |
| 15 | $925,841 | $303,506 | $102,844 | $387,624 | $0 | $702,834 | $0 | $2,422,648 | $579,962 |
| 16 | $953,616 | $312,611 | $87,339 | $403,129 | $0 | $0 | $0 | $1,756,694 | $382,308 |
| 17 | $982,225 | $321,989 | $71,214 | $419,254 | $0 | $0 | $0 | $1,794,681 | $355,068 |
| 18 | $1,011,692 | $331,649 | $54,443 | $436,024 | $0 | $0 | $0 | $1,833,808 | $329,826 |
| 19 | $1,042,042 | $341,598 | $37,002 | $453,465 | $0 | $0 | $0 | $1,874,108 | $306,431 |
| 20 | $1,073,304 | $351,846 | $18,864 | $471,603 | $0 | $814,777 | $0 | $2,730,394 | $405,855 |
| **Total** | **$16,447,090** | **$5,391,622** | **$3,143,732** | **$6,665,613** | **$0** | **$2,646,856** | **$0** | **$34,294,913** | **$13,517,005** |

The **lifecycle cost savings for the proposed ECMs is $11,162,292** over a period of 20 years for the Police Building.

## APPENDIX A: HVAC ECM DESCRIPTIONS

**VAV System Conversion:**

Constant speed air handling units waste energy by conditioning and supplying excess air when the heating and cooling demands of the spaces are below peak deign conditions. For buildings with 100% outside air perimeter induction units, excess outside air beyond the amount needed for ventilation further increases the building's energy consumption.

Variable air volume (VAV) distribution systems reduce supply air volume as well as the demand for cooling and reheat during non-peak cooling conditions. A significant amount of energy can be saved by converting from a constant volume to variable volume air distribution system. Variable speed drives adjust the speed of the fan motor as demand for supply air increase or decreases. As an illustration, a 50% reduction in fan motor speed results in an 87.5% reduction in fan energy. Variable speed drives typically represent the best overall approach to reduce fan energy while increasing reliability and minimizing first cost and maintenance cost when serving areas with variable loads.

For buildings with perimeter induction units, we recommend removing the constant volume induction air handling units and replacing the existing VAV air handlers. These new VAV air handlers should be designed to handle the load from the perimeter spaces once the constant volume induction air handling units are removed. The whole building should operate as a VAV system, with hot water radiators providing perimeter heat instead of window induction units. Extensive ductwork modifications on each floor will be necessary to rezone the air distribution systems. This system conversion will save energy and improve the thermal comfort of the occupants. Furthermore maintenance costs will be reduced since there will be less air handling units to maintain.

For buildings with constant volume multi-zone units or air handlers with inlet guide vanes, we recommend replacing the existing air handling units with VAV units controlled by variable speed drives. For the multi-zone systems, new VAV terminal units can be added to serve each existing zone. For the systems with inlet guide vanes, the existing terminal units can be replaced with new VAV units with direct digital controls (DDC). Existing radiators can remain in place, with new DDC control valves added. For both of these system conversions, most of the existing ductwork can remain in place with only minor modifications since most of the system zoning will remain the same.

Once all of the main air handling units are upgraded to VAV, several advanced controls strategies can be implemented to further optimize the energy performance of the system, including demand control ventilation, critical zone reset, adaptive unoccupied set back, and zone-level HVAC set back. The four advanced controls strategies recommended as part of this ECM are described below.

**Advanced Controls: Demand Control Ventilation**

A building is designed to support the health and comfort of its occupants. Part of this design strategy is to provide an adequate amount of outdoor air, or “fresh air”, to counteract any harmful gases released by building occupants and equipment. Often times this fresh air is delivered as if the building was at full occupancy, regardless of whether or not it is occupied at all. This fresh air has to be conditioned in order to satisfy building temperature set points. The cost to condition this air is a significant portion of the total energy cost for most building HVAC systems. If the outdoor air can be minimized, or eliminated, when the building has little or no occupants, energy savings can be significant. Because population shifts over a large range in many of building spaces, Demand Control Ventilation (DCV) is an excellent energy savings opportunity.

People generate bioeffluents (ammonia, methane, etc.). Bioeffluents are typically the largest source of indoor air contaminants in a building. Since $CO_2$ is generated by respiration at nearly the same rate as other bioeffluents, $CO_2$ is an excellent indicator of human respiration, building occupancy level and indoor air quality. A DCV control strategy varies the amount of fresh air brought into buildings according to indoor $CO_2$ levels. The volume of outside air (OA) introduced through the air handlers is constantly regulated so that the return air $CO_2$ level is no more than 700 ppm higher than outside air as recommended by ASHRAE.

Demand Control Ventilation should be implemented on all new VAV air handling units. A comprehensive $CO_2$ Demand Control Ventilation strategy typically includes:

- Review of design minimum ventilation rates to ensure compliance with ASHRAE 62.1-2007 and local codes.
- Inspection and testing of outside air dampers to verify proper operation and to ensure that outside air dampers close tight during unoccupied modes such as morning warm-up.
- Implementation of outside air flow measurement to ensure adequate quantities of OA are introduced as supply fan speed varies the amount introduced.
- Installation of $CO_2$ sensors to measure return air and outside air carbon dioxide levels.

**Advanced Controls: Critical Zone Reset**

Typically, a variable volume air handler modulates fan speed to maintain static pressure set point at a constant value. The static pressure set point is normally higher than is required to ensure adequate air is delivered to all zones. A more efficient approach is to reset the static pressure set point based on the position of the VAV damper serving the critical zone. The critical zone is defined as the VAV box damper that is the most open. Static pressure is reset so that the critical zone damper is almost fully open. This ensures that demand is met while not wasting energy. We recommend implementation of the following sequence of operation on all new VAV air handlers:

- **Supply Air Temperature Reset for Variable Volume Systems**. The supply air temperature set point shall be reset based on building demand. If the supply fan speed is greater than 90%, then the supply air temperature set point shall be reset downward until fan speed is less than 80% or until the minimum supply air temperature set point is reached. If the supply fan speed is less than 25%, then the supply air temperature set point shall be reset upward until the supply fan speed is greater than 35% or until the maximum supply air temperature set point is reached. The default supply air temperature set point shall be 55°F and the minimum/maximum supply air temperature set points shall be 52°F / 60°F. The maximum supply air temperature set point shall be reset downward if the space relative humidity level is above the set point. If the supply fan speed is less than 25% and the supply air set point has been reset to its maximum value, then the minimum VAV box damper position shall be globally set to 20% (adjustable) until fan speed is greater than 35%.

- **Critical Zone Supply Air Static Pressure Reset – Variable Volume Systems**. The supply air fan speed shall modulate to maintain the static pressure set point. The static pressure set point shall be reset every 5 minutes based on the position of the critical zone damper. If the critical zone damper is greater than 95% open, then the static pressure set point shall be rest upward until the critical damper position is less than 90% open or until the maximum static pressure set point is reached. If the critical zone damper is 85% open, then the static pressure set point shall be rest downward until the critical damper position is 90% open. The static pressure shall be measured immediately downstream of the air handler and upstream of any branch ducts. The initial default static pressure set point shall be equal to the scheduled external static pressure and the maximum static pressure set point shall be 0.50 in wc above the initial default set point. initially all zones shall be included in the critical zone reset strategy, however the operator shall have the ability to select and unselect the zones to include as well as the ability to bypass the critical zone reset strategy altogether and instead utilize the initial default static pressure as a constant value.

**Advanced Controls: Unoccupied System Setback**

Currently the HVAC systems are controlled by occupants. When occupants are given control of a building's HVAC system, set points and schedules often exceed the range of temperatures and occupied hours ideal for energy efficiency. As a result, systems operate more hours than needed. In addition to this, the interior VAV systems in the Court Tower have limited unoccupied setback, reducing the fan speed to only 50% during nights and weekends when the building is unoccupied and does not need to be maintained at the same temperatures for thermal comfort.

Thermostat set points should be set with consideration of occupant feedback, but with limited occupant control. Limited occupant control can be accomplished through thermostat locks, enforced set point and schedule settings, and/or zone-level set point ranges. Also, the temperature of the building should be setback at nights and during weekends when the building is unoccupied to save energy. The outside air dampers should close when no ventilation is needed and the fans shall turn off, cycling on only when needed to maintain the setback temperature. Morning warm-up and cool-down sequences can be implemented to ensure that the building is comfortable when occupants enter the building. We recommend implementation of this energy conservation measure on all new VAV air handlers.

**Advanced Controls: Zone Level HVAC Setback**

Currently the amount of air required to maintain space temperature set point in a space when it is unoccupied during normal building occupied hours is less than the amount delivered at the minimum VAV position. This results in increased cooling load, fan energy and reheat. Historically, the minimum VAV airflow set point is 30% of the air flow required at the peak space sensible load. This is typically more air than is required to cool a space when unoccupied. Factoring in more efficient lighting and automatic controls that shut off lights when a space is unoccupied the amount of air required when a space is unoccupied is often minimal to none.

The zone level HVAC set back approach utilizes the same room occupancy sensor that turns off the lights to set back HVAC system at the zone level during normal building/system occupied hours. A 3˚F space temperature deadband is utilized to ensure a space does not get too far out of set point during normal building occupied hours. If an occupied space temperature set point is 75˚F and the space temperature got above 78˚F due to a high solar load while unoccupied during normal building occupied hours, the VAV box would modulate open until space temperature was 75˚F and then would again close.

We recommend implementation of this energy conservation measure on all new VAV air handlers. Occupancy sensors with dual contacts for lighting and HVAC controls can be installed to achieve this energy conservation measure as well as the occupancy sensor lighting upgrade. New occupancy sensors should be installed in the following locations:

- Private and open offices
- Conference rooms and classrooms
- Courtrooms, jury rooms and jury waiting
- Break rooms and dining rooms
- Recreation rooms
- Storage rooms

Where existing occupancy sensors already exist, they can be retrofitted with a relay-in-a-box (RIB) to control the HVAC system or replaced with a new occupancy sensor with dual contacts to allow for control of both the lighting and HVAC systems.

**Variable Primary Pumps:**

The existing heating hot water and chilled water pumps are configured in a constant flow, primary-secondary arrangement. The primary pumps distribute heating hot water and chilled water from the heating and cooling plants to the secondary pumps. The secondary pumps distribute heating hot water and chilled water to the air handling units, perimeter window induction units, and radiators. Each operational pump has a stand-by pump for use by both the heating hot water and chilled water systems, with manual changeover. Since the pumps are constant speed, energy is wasted by using the same amount of power when the heating and cooling demands of the building are reduced as is when in full demand.

A significant amount of energy can be saved by converting the water distribution from constant flow to variable flow. Variable speed drives reduce the speed of the pump motor as demand for flow decreases. The change in the amount of energy a motor consumes is related to the cube of the change in speed; therefore, a 50% reduction in pump motor speed results in an 87.5% reduction in pump energy. We recommend installing variable frequency drives (VFDs) on the primary heating hot water and chilled water pumps and eliminating the secondary pumps.

New 2-way modulating control valves can be installed to control the water flow through the air handling unit coils and window induction units or new radiators. The existing primary pumps should be replaced with larger pumps to handle the additional pressure and utilize with premium efficient inverter duty motors and new DDC controls to properly modulate pump speed in response to changes in demand. Further savings can be achieved by utilizing a critical valve position pressure set point reset strategy. In addition to saving energy, the new pumping configuration will require less maintenance since the total number of HVAC pumps will be reduced significantly.

## APPENDIX B: LIGHTING ECM DESCRIPTIONS

**LED Lighting Upgrade:**
We recommend developing solutions that target specific needs of the Users as well as transforms the appearance and image of the Justice Center. It is recommended any lighting retrofit, replacement, or upgrade programs strongly consider the use of LED light sources for watts/SF reduction while maintaining quality of light. There are several reasons for using LED light sources, because of their unique solid-state design, LED lights require no warm up time, are very durable, require virtually no maintenance, and have a long life expectancy, (50,000 hr +). LEDs have a significantly higher level of energy efficiency than incandescent, CFL, and halogen bulbs, and are available in an array of color temperatures and beam spreads. With coordinated power modules and controls, most LEDs offer dimming ability. LEDs are also environmentally friendly as they contain no mercury.

With LED lights, the lighting power density (LPD) can be reduced 30% below ASHRAE 90.1-2007 maximum values by space type.

**Occupancy Sensors:**
At the Justice Center complex, lights primarily remain on during building operational hours even when spaces are unoccupied. Occupancy sensors enable lights to come on when an occupant enters the room and automatically turn off 15 to 30 minutes after the space is vacant. The following spaces throughout the complex should be outfitted with occupancy sensors, where not already installed:

- Private offices
- Conference rooms and classrooms
- Jury rooms (Court Tower)
- Break rooms and dining rooms
- Restrooms and locker rooms
- Laundry rooms and kitchens
- Recreation rooms
- Laboratories (Police)
- Storage rooms

In addition to turning off the lights, the occupancy sensors can be used to reduce heating and cooling energy through a zone level HVAC setback strategy. For this reason, we recommend that all occupancy sensors be installed with dual contacts to allow for control of both the lighting and HVAC systems.

**Daylight Harvesting:**
In areas within buildings that have large windows, particularly large atriums and office spaces with large window walls or skylights, daylight sensors and dimmable ballasts can be used to reduce artificial lighting levels in response to natural daylight to provide a consistent room illumination level. Utilizing natural daylight improves occupant comfort and can significantly reduce energy consumption.

The exterior office areas in the Court Tower have sufficient access to daylight for daylight harvesting. In addition to this, the Atrium gallery provides a great opportunity for daylight harvesting through both the windows and skylights on the roof.

## APPENDIX C: ENVELOPE ECM DESCRIPTIONS

**Roof Replacement:**
The rubberized asphalt roofs in place at the CCJC are of an age, type and condition that offer little sustainable renovation opportunities. Given the age and condition, we recommend that all roofs be scheduled for replacement in accordance with the management plan. New roof systems should be selected based upon the longevity, maintainable service life, recycled material content, and impact on the environment. Increasing the "R-Value" of the insulation to at least the code required R-25 (as of January 2014) will help reduce the energy needed to heat and cool the structures. In addition to the system replacement, we recommend a regular roof maintenance program be developed to ensure the long term function of the roof system and insulation. This program contributes to longer life spaces and reduced energy loss as the materials / buildings age.

The existing roofs at CCJC were modeled with a thermal resistance of R-14.7 and the new roofs were modeled with a thermal resistance of R-25. New roofs will be added to all five building structures.

**Facade Maintenance:**
The granite and pre-cast concrete panels that make up the majority of the façades are fixed materials and need to be maintained to ensure their proper performance. Currently there are two main materials that are required for the CCJC restoration project: sealants and water repellents.

- Sealants or caulk joints are found at all joints between granite panels and at the perimeters of all fenestrations. There are two main sealant types (silicone and urethane) that may be used. Both products offer pros and cons for selection. Both types have products that meet or exceed the current Ohio VOC compliance regulation while still offering proper adhesion, movement and performance. Typically silicone based sealants are found to perform better for longer than urethanes.
- Water repellents are used on stone and precast to prevent water infiltration and the resulting damage that it causes. Current low-VOC compliant materials provide between five and seven years of protection.

The existing perimeter zones at CCJC were modeled with an infiltration of 2.5 air changes per hour (ACH) to represent the loose construction of the leaking envelope. The repaired façade was modeled with an infiltration rate of 0.6 ACH to represent average construction of the repaired envelope.

**Window Upgrade:**
The windows, curtain walls, and doors are largely original to the building. Although they are still generally performing (leaks are largely attributed to the failed sealant joints) there have been marked improvements in energy efficiencies in these items since the CCJC was constructed. As part of a sustainable improvement initiative we recommend all non-security grade windows be replaced to garner a greater level of energy efficiency.

There are many factors that weigh in when selecting replacement windows beyond appearance and initial cost. Long term performance and energy efficiencies are chief among those factors. Although single-pane glass windows will be less expensive to install, because of their inefficiencies in allowing high rates of heat transfer (U-Value) and low rates of heat resistance (R-Value) they are not ideal.

Although windows typically have the lowest R-Value of a façade assembly, there are improvements that can be made over the windows in place. Single-pane windows typically have an R-Value of less than 1. The R-Value of double-pane windows can vary depending on low emissivity or Low-E glazing, the thickness of the glass, tightness of the installation, insulating films, gas between panes, and the air space between the panes. These factors can increase the R-Value to over an R-Value of 4.

The existing single pane bronze windows at CCJC were modeled with a U-value of 1.071 Btuh/sf-°F and a shading coefficient of 0.71. The new double pane windows were modeled with a U-value of 0.25 Btuh/sf-°F and a shading coefficient of 0.35. New windows are modeled for the Court Tower and Police building only. Jail I and Jail II do not have enough windows for an upgrade to significantly reduce the buildings' energy consumption and the curtainwall and skylights on the Atrium building will be difficult to replace, so this energy conservation measure is not recommended for these three buildings from an energy efficiency perspective only.

# APPENDIX D: COURT TOWER/ATRIUM COST ESTIMATES

| | | | | |
|---|---|---|---|---|
| OSBORN ESTIMATE WORKSHEET | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center Facility Assessment Cleveland, Ohio | | PURPOSE Estimated Project Cost | STUDY |
| | | | ITEM Summary by Sheet | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | Labor Rate: $ 65.00 | DATE 12/11/13 | SHEET NO. 1 OF 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|
| COST SUMMARY BY SHEET | | | | | | | | | |
| Occupancy Sensors | | | $83,610 | | | $28,340 | $111,950 | $123,145 | $145,311 |
| Variable Primary Pumps | | | $362,783 | | | $202,406 | $565,189 | $621,708 | $733,616 |
| Garage LED Lighting | | | $109,626 | | | $35,629 | $145,255 | $159,780 | $188,541 |
| LED Lighting Upgrade | | | $891,825 | | | $664,413 | $1,556,238 | $1,711,862 | $2,019,997 |
| VAV with Advanced Controls | | | $7,737,307 | | | $2,904,066 | $10,641,373 | $11,705,510 | $13,812,502 |
| Daylight Harvesting | | | $365,178 | | | $221,271 | $586,449 | $645,094 | $761,211 |
| Façade Maintenance | | | $528,091 | | | $0 | $528,091 | $580,900 | $685,462 |
| Window Upgrade | | | $9,772,440 | | | $0 | $9,772,440 | $10,749,684 | $12,684,627 |
| Roof Replacement | | | $1,603,984 | | | $0 | $1,603,984 | $1,764,383 | $2,081,972 |
| Court Tower Plumbing Fixtures | | | $441,216 | | | $207,441 | $648,657 | $713,522 | $841,956 |
| Atrium Plumbing Fixtures | | | $17,784 | | | $8,116 | $25,900 | $28,489 | $33,618 |
| SUBTOTAL 1 | | | $21,913,845 | | | $4,271,680 | $26,185,525 | $28,804,078 | $33,988,812 |
| GENERAL CONDITIONS | 10% | | | | | | $2,618,553 | | |
| SUBTOTAL 2 | | | | | | | $28,804,078 | | |
| ESCALATION TO MIDPOINT OF CONSTRUCTION | 0.00% | | | | | | $0 | | |
| SUBTOTAL 3 | | | | | | | $28,804,078 | | |
| DESIGN CONTINGENCY | 0% | | | | | | $0 | | |
| ECCA (Estimated Construction Cost at Award) | | | | | | | $28,804,078 | | |
| ARCHITECTURAL FEES | 8% | | | | | | $2,304,326 | | |
| CONSTRUCTION CONTINGENCY | 10% | | | | | | $2,880,408 | | |
| CONSTRUCTION MANAGEMENT FEE | 0% | | | | | | $0 | | |
| | | | | | | TOTAL CONSTRUCTION COST | $ 33,988,812 | | |

## ECM-1: Occupancy Sensors

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost | STUDY |
| | | | ITEM Occupancy Sensors | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY | | MATERIAL | | LABOR | | | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| | NO. UNITS | UNIT MEAS. | PER UNIT | SUBTOTAL | OT (y/n) | PER UNIT | SUBTOTAL | | | |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 194.0 | ea | 125.00 | $ 24,250 | n | 72 | $ 13,871.00 | $ 38,121 | $ 41,933 | $ 49,481 |
| Wall Occupancy Sensor (1 per office) | 742.0 | ea | 80.00 | $ 59,360.00 | n | 20 | $ 14,469.00 | $ 73,829 | $ 81,212 | $ 95,830 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 83,610** | | | **$ 28,340** | **$ 111,950** | **$ 123,145** | **$ 145,311** |

## ECM-2: Variable Primary Pumps

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20130278 | CONTRACT NO. |
| **ESTIMATE WORKSHEET** | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>Variable Primary Pumps | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** *0.60* | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Pumps up to 5 HP | 30.0 | ea | - | $ - | n | 173 | $ 5,200.65 | $ 5,201 | $ 5,721 | $ 6,750 |
| Remove Existing Pumps 7.5-15 HP | 8.0 | ea | - | $ - | n | 416 | $ 3,328.00 | $ 3,328 | $ 3,661 | $ 4,320 |
| Remove Existing Pumps 30-60 HP | 3.0 | ea | - | $ - | n | 1950 | $ 5,850.00 | $ 5,850 | $ 6,435 | $ 7,593 |
| Remove Existing Pumps 75-100 HP | 1.8 | ea | - | $ - | n | 2600 | $ 4,680.00 | $ 4,680 | $ 5,148 | $ 6,075 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Heating Hot Water Pumps - (3) 50 HP | 150.0 | hp | 545.00 | $ 81,750.00 | n | 195 | $ 29,250.00 | $ 111,000 | $ 122,100 | $ 144,078 |
| Chilled Water Pumps - (3) 100 HP | 180.0 | hp | 545.00 | $ 98,100.00 | n | 195 | $ 35,100.00 | $ 133,200 | $ 146,520 | $ 172,894 |
| Air Separator | 1.2 | ea | 15,000.00 | $ 18,000.00 | n | 1040 | $ 1,248.00 | $ 19,248 | $ 21,173 | $ 24,984 |
| Expansion Tank & City Water Piping | 1.2 | ea | 10,000.00 | $ 12,000.00 | n | 1040 | $ 1,248.00 | $ 13,248 | $ 14,573 | $ 17,196 |
| Heating Plant VFDs - (3) 50 hp | 150.0 | hp | 150.00 | $ 22,500.00 | n | 0 | $ - | $ 22,500 | $ 24,750 | $ 29,205 |
| Cooling Plant VFDs - (3) 100 hp | 180.0 | hp | 150.00 | $ 27,000.00 | n | 0 | $ - | $ 27,000 | $ 29,700 | $ 35,046 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PIPING** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 12" SCH 40 CS Pipe - Welded | 45.0 | lft | 87.50 | $ 3,937.50 | n | 82 | $ 3,694.28 | $ 7,632 | $ 8,395 | $ 9,906 |
| 12" Elbows | 3.6 | ea | 590.00 | $ 2,124.00 | n | 624 | $ 2,246.40 | $ 4,370 | $ 4,807 | $ 5,673 |
| 12" Tees | 3.6 | ea | 975.00 | $ 3,510.00 | n | 975 | $ 3,510.00 | $ 7,020 | $ 7,722 | $ 9,112 |
| 12" Butterfly Valves | 3.6 | ea | 1050.00 | $ 3,780.00 | n | 520 | $ 1,872.00 | $ 5,652 | $ 6,217 | $ 7,336 |
| 10" SCH 40 CS Pipe - Welded | 75.0 | lft | 67.00 | $ 5,025.00 | n | 65 | $ 4,875.00 | $ 9,900 | $ 10,890 | $ 12,850 |
| 10" Elbows | 6.0 | ea | 400.00 | $ 2,400.00 | n | 520 | $ 3,120.00 | $ 5,520 | $ 6,072 | $ 7,165 |
| 10" Tees | 6.0 | ea | 695.00 | $ 4,170.00 | n | 780 | $ 4,680.00 | $ 8,850 | $ 9,735 | $ 11,487 |
| 10" Butterfly Valves | 6.0 | ea | 715.00 | $ 4,290.00 | n | 390 | $ 2,340.00 | $ 6,630 | $ 7,293 | $ 8,606 |
| 3-Inch Sch 40 Steel Pipe | 950.0 | lft | 19.50 | $ 18,525.00 | n | 24 | $ 22,971.00 | $ 41,496 | $ 45,646 | $ 53,862 |
| 3-inch BW Steel Elbows | 76.0 | ea | 29.00 | $ 2,204.00 | n | 149 | $ 11,292.84 | $ 13,497 | $ 14,847 | $ 17,519 |
| 3-inch BW Steel Tees | 76.0 | ea | 84.00 | $ 6,384.00 | n | 260 | $ 19,760.00 | $ 26,144 | $ 28,758 | $ 33,935 |
| 3-inch Butterfly Valves | 38.0 | ea | 96.50 | $ 3,667.00 | n | 130 | $ 4,940.00 | $ 8,607 | $ 9,468 | $ 11,172 |
| Thermometers | 42.8 | ea | 75.00 | $ 3,210.00 | n | 16 | $ 695.50 | $ 3,906 | $ 4,296 | $ 5,069 |
| Pressure Gauges | 42.8 | ea | 35.00 | $ 1,498.00 | n | 16 | $ 695.50 | $ 2,194 | $ 2,413 | $ 2,847 |
| Insulation | 1070.0 | lft | 1.41 | $ 1,508.70 | n | 5 | $ 5,564.00 | $ 7,073 | $ 7,780 | $ 9,180 |
| Motor Connections | 6.0 | ea | 225.00 | $ 1,350.00 | n | 520 | $ 3,120.00 | $ 4,470 | $ 4,917 | $ 5,802 |
| Conduits and Feeders | 600.0 | lft | 24.00 | $ 14,400.00 | n | 16 | $ 9,750.00 | $ 24,150 | $ 26,565 | $ 31,347 |
| MCC Pump Breakers | 6.0 | ea | 3,575.00 | $ 21,450.00 | n | 163 | $ 975.00 | $ 22,425 | $ 24,668 | $ 29,108 |
| Programming | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Test / Check & Start Up | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Balancing / Commissioning | 1.0 | ea | - | $ - | n | 5200 | $ 5,200.00 | $ 5,200 | $ 5,720 | $ 6,750 |
| | | | | $362,783.20 | | | **$202,406.17** | **$ 565,189** | **$ 621,708** | **$ 733,616** |

## ECM-3: Garage LED Lighting

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>Garage LED Lighting | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | SUBTOTAL | LABOR OT (y/n) | PER UNIT | SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 70W LED Flood Light | 274 | ea | 400.00 | $ 109,626 | n | 130 | $ 35,629 | $ 145,255 | $ 159,780 | $ 188,541 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 109,626** | | | **$ 35,629** | **$ 145,255** | **$ 159,780** | **$ 188,541** |

## ECM-4: LED Lighting Upgrade

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>LED Lighting Upgrade | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | SUBTOTAL | LABOR OT (y/n) | PER UNIT | SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove and Dispose Existing Lights | 20,958 | lamps | 2.75 | $ 57,636 | n | 10 | $204,344.80 | $ 261,981 | $ 288,179 | $ 340,051 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 2x2 LED Lighting Fixture | 5,056 | ea | 165.00 | $ 834,190 | n | 91 | $460,068.22 | $ 1,294,258 | $ 1,423,684 | $ 1,679,947 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 891,825** | | | **$ 664,413** | **$ 1,556,238** | **$ 1,711,862** | **$ 2,019,997** |

## ECM-5: VAV with Advanced Controls

| ESTIMATE WORKSHEET | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
|---|---|---|---|---|
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove AHUs (AC-1 to 6, AC-13 to 16) | 1910.0 | tons | - | $ - | n | 98 | $ 186,225 | $ 186,225 | $ 204,848 | $ 241,720 |
| Remove Window Induction Units | 1278.0 | ea | - | $ - | n | 65 | $ 83,070 | $ 83,070 | $ 91,377 | $ 107,825 |
| Remove VAV Boxes | 394.0 | ea | - | $ - | n | 130 | $ 51,220 | $ 51,220 | $ 56,342 | $ 66,484 |
| Remove SA Ductwork | 1.0 | ea | - | $ - | n | 150800 | $ 150,800 | $ 150,800 | $ 165,880 | $ 195,738 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Air Handler (6 Total Units) | 470,000 | cfm | 4.50 | $ 2,115,000.00 | n | 1.63 | $ 763,750 | $ 2,878,750 | $ 3,166,625 | $ 3,736,618 |
| Connect SA, RA, EA Ductwotk | 6.00 | ea | 50000 | $ 300,000.00 | n | 5200 | $ 31,200 | $ 331,200 | $ 364,320 | $ 429,898 |
| Chilled Water Branch Piping | 6.00 | ea | 25000 | $ 150,000.00 | n | 10400 | $ 62,400 | $ 212,400 | $ 233,640 | $ 275,695 |
| Chilled Water Branch Piping | 6.00 | ea | 25000 | $ 150,000.00 | n | 10400 | $ 62,400 | $ 212,400 | $ 233,640 | $ 275,695 |
| Heating Hot Water Branch Piping | 6.00 | ea | 15000 | $ 90,000.00 | n | 7800 | $ 46,800 | $ 136,800 | $ 150,480 | $ 177,566 |
| SAF Variable Speed Drive | 1,200.00 | hp | 150 | $ 180,000.00 | n | 0 | $ - | $ 180,000 | $ 198,000 | $ 233,640 |
| RAF Variable Speed Drive | 450.00 | hp | 150 | $ 67,500.00 | n | 0 | $ - | $ 67,500 | $ 74,250 | $ 87,615 |
| Test / Check & Start Up | 6.0 | ea | 0.00 | $ - | n | 3900 | $ 23,400 | $ 23,400 | $ 25,740 | $ 30,373 |
| Balancing | 6.0 | ea | 0.00 | $ - | n | 6500 | $ 39,000 | $ 39,000 | $ 42,900 | $ 50,622 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **AIR DISTRIBUTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Single Duct VAV Boxes | 926 | ea | 1750 | $ 1,620,500.00 | n | 260 | $ 240,760 | $ 1,861,260 | $ 2,047,386 | $ 2,415,915 |
| Rework Branch Ductwork Upstream of VAV | 22,224 | lbs | 2.5 | $ 55,560.00 | n | 3 | $ 72,228 | $ 127,788 | $ 140,567 | $ 165,869 |
| Install New SA Dist Duct Downstream of V/ | 22,224 | lbs | 2.0 | $ 44,448.00 | n | 3 | $ 72,228 | $ 116,676 | $ 128,344 | $ 151,445 |
| Install New RGD's | 3,704 | ea | 75 | $ 277,800.00 | n | 65 | $ 240,760 | $ 518,560 | $ 570,416 | $ 673,091 |
| Control Wiring | 926 | ea | 25 | $ 23,150.00 | n | 16 | $ 15,048 | $ 38,198 | $ 42,017 | $ 49,580 |
| Temperature Sensor | 926 | ea | 100 | $ 92,600.00 | n | 16 | $ 15,048 | $ 107,648 | $ 118,412 | $ 139,726 |
| Programming & Graphics | 926 | ea | 0 | $ - | n | 16 | $ 15,048 | $ 15,048 | $ 16,552 | $ 19,532 |
| Balance VAVs | 926 | ea | 0 | $ - | n | 33 | $ 30,095 | $ 30,095 | $ 33,105 | $ 39,063 |
| Balance RGD's | 3,704 | ea | 0 | $ - | n | 16 | $ 60,190 | $ 60,190 | $ 66,209 | $ 78,127 |
| Balance HW Coils | 0 | ea | 0 | $ - | n | 33 | $ - | $ - | $ - | $ - |
| Test / Check / Start Up | 926 | ea | 0 | $ - | n | 33 | $ 30,095 | $ 30,095 | $ 33,105 | $ 39,063 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Duct Mains - Horizontal | 171,550 | lbs | 6 | $ 1,029,297.00 | n | 0 | $ - | $ 1,029,297 | $ 1,132,227 | $ 1,336,028 |
| New Duct Mains - Risers | 0 | lbs | 10 | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PERIMETER HEAT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Perimeter Heat (BBD + Piping) | 1,278.00 | ea | 500 | $ 639,000.00 | n | 260 | $ 332,280 | $ 971,280 | $ 1,068,408 | $ 1,260,721 |
| Install 3/4" (avg size) 2-way Control Valves | 639.00 | ea | 175 | $ 111,825.00 | n | 28 | $ 17,819 | $ 129,644 | $ 142,608 | $ 168,277 |
| Balance Perimter Heat | 1278.0 | | - | $ - | n | 33 | $ 41,535 | $ 41,535 | $ 45,689 | $ 53,912 |
| Test / Check / Start Up | 29 | floors | 0 | $ - | n | 1040 | $ 30,160 | $ 30,160 | $ 33,176 | $ 39,148 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ELECTRICAL** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| MCC Breakers - 225 amps 211.97 | 6.0 | ea | $ 1,675 | $ 10,050.00 | n | 130 | $ 780 | $ 10,830 | $ 11,913 | $ 14,057 |
| Motor Connections (200 HP) | 6.0 | ea | $ 500 | $ 3,000.00 | n | 1040 | $ 6,240 | $ 9,240 | $ 10,164 | $ 11,994 |
| Conduit and Feeders | 600.0 | lft | $ 41 | $ 24,300.00 | n | 26 | $ 15,600 | $ 39,900 | $ 43,890 | $ 51,790 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| MCC Breakers - 100 amps 79.49 | 6.0 | ea | $ 950 | $ 5,700.00 | n | 130 | $ 780 | $ 6,480 | $ 7,128 | $ 8,411 |
| Motor Connections (75 HP) | 6.0 | ea | $ 125 | $ 750.00 | n | 390 | $ 2,340 | $ 3,090 | $ 3,399 | $ 4,011 |
| Conduit and Feeders | 600.0 | lft | $ 11 | $ 6,780.00 | n | 14 | $ 8,580 | $ 15,360 | $ 16,896 | $ 19,937 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Manlift / Scaffold / Chainfalls, etc | 1.0 | | 25000 | $ 25,000.00 | n | 0 | $ - | $ 25,000 | $ 27,500 | $ 32,450 |
| Commissioning | 1.0 | ls | 250000 | $ 250,000.00 | n | 0 | $ - | $ 250,000 | $ 275,000 | $ 324,500 |
| | | | | **$ 7,272,260** | | | **$ 2,747,877** | **$ 10,020,137** | **$ 11,022,151** | **$ 13,006,138** |

## ECM-5: VAV with Advanced Controls (Continued)

| | | | |
|---|---|---|---|
| OSBORN ENGINEERING<br>**ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland<br>DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | PURPOSE: Estimated Project Cost<br>STUDY<br>ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ<br>LABOR RATE: $65.00 /HR<br>DATE: 12/11/13 | Page 2 of 3 | |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **BAS FRONT END** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Operator Workstation | 1.0 | ea | 2,500.00 | $ 2,500.00 | n | 0 | $ - | $ 2,500 | $ 2,750 | $ 3,245 |
| Printer | 1.0 | ea | 250.00 | $ 250.00 | n | 0 | $ - | $ 250 | $ 275 | $ 325 |
| Software | 1.0 | ls | 10,000.00 | $ 10,000.00 | n | 0 | $ - | $ 10,000 | $ 11,000 | $ 12,980 |
| Graphics Package | 1.0 | ea | 5,000.00 | $ 5,000.00 | n | 0 | $ - | $ 5,000 | $ 5,500 | $ 6,490 |
| LAN | 1.0 | ls | 100,000 | $ 100,000.00 | n | 0 | $ - | $ 100,000 | $ 110,000 | $ 129,800 |
| NAE | 6.0 | ea | 10,000 | $ 60,000.00 | n | 1040 | $ 6,240.00 | $ 66,240 | $ 72,864 | $ 85,980 |
| Utility Metering | 1.0 | ls | 50,000.00 | $ 50,000.00 | n | 0 | $ - | $ 50,000 | $ 55,000 | $ 64,900 |
| Web Browser | 1.0 | ea | 12,000.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Set Up Building Schedules | 25.0 | ea | - | $ - | n | 130 | $ 3,250.00 | $ 3,250 | $ 3,575 | $ 4,219 |
| Set Up AHU Schedules | 6.0 | ea | - | $ - | n | 130 | $ 780.00 | $ 780 | $ 858 | $ 1,012 |
| Programming, Testing, Commissioning | 1.0 | ls | - | $ - | n | 10400 | $ 10,400.00 | $ 10,400 | $ 11,440 | $ 13,499 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **GLOBAL POINTS** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| OA Temperature Transmitter - GLOBAL | 4.0 | ea | 225.00 | $ 900.00 | n | 65 | $ 260.00 | $ 1,160 | $ 1,276 | $ 1,506 |
| OA Humidity Transmitter - GLOBAL | 4.0 | ea | 225.00 | $ 900.00 | n | 65 | $ 260.00 | $ 1,160 | $ 1,276 | $ 1,506 |
| OA CO2 | 4.0 | ea | 500.00 | $ 2,000.00 | n | 65 | $ 260.00 | $ 2,260 | $ 2,486 | $ 2,933 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **DEMAND CONTROL VENTILATION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **CRITICAL ZONE RESET** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **SYSTEM LEVEL SETBACK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ZONE LEVEL UNOCCUPIED SETBACK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 194.0 | ea | 125.00 | $ 24,250.00 | n | 72 | $ 13,871.00 | $ 38,121 | $ 41,933 | $ 49,481 |
| Wall Occupancy Sensor (1 per office) | 742.0 | ea | 80.00 | $ 59,360.00 | n | 20 | $ 14,469.00 | $ 73,829 | $ 81,212 | $ 95,830 |
| Existing Occ Sensor - Replace or Tie-In | 177.0 | ea | 80.00 | $ 14,160.00 | n | 72 | $ 12,655.50 | $ 26,816 | $ 29,497 | $ 34,807 |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 341,320** | | | **$ 72,846** | **$ 414,166** | **$ 455,582** | **$ 537,587** |

## ECM-5: VAV with Advanced Controls (Continued)

| OSBORN ENGINEERING ESTIMATE WORKSHEET | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
|---|---|---|---|---|
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 3 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **AIR HANDLERS** *6* | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Space Temperature Transmitters | 0.0 | ea | 225.00 | $ - | n | 65 | $ - | $ - | $ - | $ - |
| Discharge Air Temperature Transmitters | 6.0 | ea | 225.00 | $ 1,350 | n | 65 | $ 390.00 | $ 1,740 | $ 1,914 | $ 2,259 |
| SA Duct Smoke Detector | 6.0 | ea | 350.00 | $ 2,100 | n | 260 | $ 1,560.00 | $ 3,660 | $ 4,026 | $ 4,751 |
| SA Fan Start / Stop | 6.0 | ea | 500.00 | $ 3,000 | n | 520 | $ 3,120.00 | $ 6,120 | $ 6,732 | $ 7,944 |
| SA Fan Current Sensor | 6.0 | ea | 200.00 | $ 1,200 | n | 130 | $ 780.00 | $ 1,980 | $ 2,178 | $ 2,570 |
| SA Fan Air Flow Stations | 6.0 | ea | 2500.00 | $ 15,000 | n | 520 | $ 3,120.00 | $ 18,120 | $ 19,932 | $ 23,520 |
| 4-inch, 2-Way Modulating CW Control Valv | 6.0 | ea | 3500.00 | $ 21,000.00 | n | 1040 | $ 6,240.00 | $ 27,240 | $ 29,964 | $ 35,358 |
| Low Limit Temperature Sensor | 6.0 | ea | 250.00 | $ 1,500.00 | n | 260 | $ 1,560.00 | $ 3,060 | $ 3,366 | $ 3,972 |
| Steam Control Valves | 6.0 | ea | 750.00 | $ 4,500.00 | n | 260 | $ 1,560.00 | $ 6,060 | $ 6,666 | $ 7,866 |
| Mixed Air Temperature Transmitters | 6.0 | ea | 225.00 | $ 1,350.00 | n | 65 | $ 390.00 | $ 1,740 | $ 1,914 | $ 2,259 |
| Differential Pressure Transmitters - Air | 6.0 | ea | 170.00 | $ 1,020.00 | n | 130 | $ 780.00 | $ 1,800 | $ 1,980 | $ 2,336 |
| OA Damper w/ Actuator | 6.0 | ea | 300.00 | $ 1,800.00 | n | 260 | $ 1,560.00 | $ 3,360 | $ 3,696 | $ 4,361 |
| OA Air Flow Stations | 6.0 | ea | 2,500.00 | $ 15,000.00 | n | 520 | $ 3,120.00 | $ 18,120 | $ 19,932 | $ 23,520 |
| Relief Air Damper w/ Actuator | 6.0 | ea | 300.00 | $ 1,800.00 | n | 260 | $ 1,560.00 | $ 3,360 | $ 3,696 | $ 4,361 |
| RA Damper w/ Actuator | 6.0 | ea | 300.00 | $ 1,800.00 | n | 260 | $ 1,560.00 | $ 3,360 | $ 3,696 | $ 4,361 |
| RA Duct Smoke Detector | 6.0 | ea | 350.00 | $ 2,100.00 | n | 260 | $ 1,560.00 | $ 3,660 | $ 4,026 | $ 4,751 |
| RA Temperature Transmitter | 6.0 | ea | 225.00 | $ 1,350.00 | n | 65 | $ 390.00 | $ 1,740 | $ 1,914 | $ 2,259 |
| RA Humidity Transmitter | 6.0 | ea | 225.00 | $ 1,350.00 | n | 65 | $ 390.00 | $ 1,740 | $ 1,914 | $ 2,259 |
| RA CO2 | 6.0 | ea | 500.00 | $ 3,000.00 | n | 260 | $ 1,560.00 | $ 4,560 | $ 5,016 | $ 5,919 |
| RA Fan Start / Stop | 6.0 | ea | 500.00 | $ 3,000.00 | n | 520 | $ 3,120.00 | $ 6,120 | $ 6,732 | $ 7,944 |
| RA Fan Current Sensor | 6.0 | ea | 200.00 | $ 1,200.00 | n | 130 | $ 780.00 | $ 1,980 | $ 2,178 | $ 2,570 |
| RA Fan Air Flow Stations | 6.0 | ea | 2,500.00 | $ 15,000.00 | n | 520 | $ 3,120.00 | $ 18,120 | $ 19,932 | $ 23,520 |
| Terminations | 252.0 | ea | 0.10 | $ 25.20 | n | 7 | $ 1,638.00 | $ 1,663 | $ 1,830 | $ 2,159 |
| Control Wiring | 3150.0 | lft | 0.20 | $ 630.00 | n | 3 | $ 10,237.50 | $ 10,868 | $ 11,954 | $ 14,106 |
| Conduit | 630.0 | lft | 0.40 | $ 252.00 | n | 3 | $ 2,047.50 | $ 2,300 | $ 2,529 | $ 2,985 |
| 120 Volt Feeder - 20 Amp | 6.0 | ea | 350.00 | $ 2,100.00 | n | 520 | $ 3,120.00 | $ 5,220 | $ 5,742 | $ 6,776 |
| Transformers | 12.0 | ea | 250.00 | $ 3,000.00 | n | 260 | $ 3,120.00 | $ 6,120 | $ 6,732 | $ 7,944 |
| 24 Volt Wiring | 6.0 | ea | 50.00 | $ 300.00 | n | 260 | $ 1,560.00 | $ 1,860 | $ 2,046 | $ 2,414 |
| AHU Controller | 6.0 | ea | 2,500.00 | $ 15,000.00 | n | 260 | $ 1,560.00 | $ 16,560 | $ 18,216 | $ 21,495 |
| Tie-In To BAS | 6.0 | ea | 500.00 | $ 3,000.00 | n | 1560 | $ 9,360.00 | $ 12,360 | $ 13,596 | $ 16,043 |
| Programming | 6.0 | ea | - | $ - | n | 1040 | $ 6,240.00 | $ 6,240 | $ 6,864 | $ 8,100 |
| Graphics | 6.0 | ea | - | $ - | n | 520 | $ 3,120.00 | $ 3,120 | $ 3,432 | $ 4,050 |
| Test, Comissioning, Start Up | 6.0 | ea | - | $ - | n | 520 | $ 3,120.00 | $ 3,120 | $ 3,432 | $ 4,050 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 123,727** | | | **$ 83,343** | **$ 207,070** | **$ 227,777** | **$ 268,777** |

## ECM-6: Daylight Harvesting

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>Daylight Harvesting | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Daylighting Sensors (Dimming) | 423.0 | ea | 203.00 | $ 85,869 | n | 80 | $ 33,846.35 | $ 119,715 | $ 131,687 | $ 155,391 |
| Ballast Replacement (Dimmable) | 2738.3 | ea | 102.00 | $ 279,309 | n | 68 | $187,424.62 | $ 466,734 | $ 513,407 | $ 605,820 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 365,178** | | | **$ 221,271** | **$ 586,449** | **$ 645,094** | **$ 761,211** |

## ECM-7: Facade Maintenance

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>Façade Maintenance | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Old Joint Sealant | 0.0 | lf | - | $ - | n | 1 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Caulking/sealant on Façade Joints | 24072.0 | lf | 7.00 | $ 168,504 | n | 0 | $ - | $ 168,504 | $ 185,354 | $ 218,718 |
| Apply Cement Water Repellents | 78171.0 | sf | 4.60 | $ 359,587 | n | 0 | $ - | $ 359,587 | $ 395,545 | $ 466,743 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 528,091** | | | **$ -** | **$ 528,091** | **$ 580,900** | **$ 685,462** |

## ECM-8: Window Upgrade

| OSBORN ESTIMATE WORKSHEET | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
|---|---|---|---|---|
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: Window Upgrade | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Windows - High Rise | 0.0 | sf | - | $ - | n | 12 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install New Curtainwall - High Rise | 63048.0 | sf | 155.00 | $ 9,772,440 | n | 0 | $ - | $ 9,772,440 | $ 10,749,684 | $ 12,684,627 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 9,772,440** | | | **$ -** | **$ 9,772,440** | **$ 10,749,684** | **$ 12,684,627** |

## ECM-9: Roof Replacement

| OSBORN ESTIMATE WORKSHEET | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
|---|---|---|---|---|
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: Roof Replacement | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Roof - 56,535 sf | 0.0 | ls | 500.00 | $ - | n | 17813 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Roof - Low Rise Atrium | 29131.0 | sf | 11.60 | $ 337,920 | n | 0 | $ - | $ 337,920 | $ 371,712 | $ 438,620 |
| New Roof - High Rise Court Tower | 27404.0 | sf | 46.20 | $1,266,065 | n | 0 | $ - | $ 1,266,065 | $ 1,392,671 | $ 1,643,352 |
| EPDM Membrane | 0.0 | sf | 1.50 | $ - | n | 2 | $ - | $ - | $ - | $ - |
| Lift Existing HVAC Units | 0.0 | ls | 2500.00 | $ - | n | 2600 | $ - | $ - | $ - | $ - |
| Flashing - Against Wall | 0.0 | sf | 10.00 | $ - | n | 7 | $ - | $ - | $ - | $ - |
| Flashing - Roof Edge | 0.0 | sf | 10.00 | $ - | n | 7 | $ - | $ - | $ - | $ - |
| Flashing - Roof Curbs | 0.0 | sf | 10.00 | $ - | n | 7 | $ - | $ - | $ - | $ - |
| Pitch Pockets / Tall Cone Flashing | 0.0 | ea | 100.00 | $ - | n | 130 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 1,603,984** | | | **$ -** | **$ 1,603,984** | **$ 1,764,383** | **$ 2,081,972** |

## Court Tower Plumbing Fixtures

| | | | | |
|---|---|---|---|---|
| OSBORN ESTIMATE WORKSHEET | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost; STUDY; ITEM Court Tower Plumbing Fixtures | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Water Closet | 295.0 | ea | - | $ - | n | 74 | $ 21,917.03 | $ 21,917 | $ 24,109 | $ 28,448 |
| Remove Existing Urinal | 54.0 | ea | - | $ - | n | 74 | $ 4,011.93 | $ 4,012 | $ 4,413 | $ 5,207 |
| Remove Existing Lavatory | 312.0 | ea | - | $ - | n | 65 | $ 20,280.00 | $ 20,280 | $ 22,308 | $ 26,323 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Water Closet - Wall Hung | 295.0 | ea | 705.00 | $ 207,975 | n | 179 | $ 52,903.83 | $ 260,879 | $ 286,967 | $ 338,621 |
| Water Closet Flush Valve | 295.0 | ea | 159.00 | $ 46,905 | n | 65 | $ 19,175.00 | $ 66,080 | $ 72,688 | $ 85,772 |
| New Urinal - Water Saving | 54.0 | ea | 690.00 | $ 37,260 | n | 347 | $ 18,718.83 | $ 55,979 | $ 61,577 | $ 72,661 |
| Urinal Flush Valve | 54.0 | ea | 126.00 | $ 6,804 | n | 65 | $ 3,510.00 | $ 10,314 | $ 11,345 | $ 13,388 |
| New Lavatory - Vanity Top | 312.0 | ea | 325.00 | $ 101,400 | n | 163 | $ 50,700.00 | $ 152,100 | $ 167,310 | $ 197,426 |
| Lavatory Faucet | 312.0 | ea | 131.00 | $ 40,872 | n | 52 | $ 16,224.00 | $ 57,096 | $ 62,806 | $ 74,111 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 441,216** | | | **$ 207,441** | **$ 648,657** | **$ 713,522** | **$ 841,956** |

## Atrium Plumbing Fixtures

| | | | | |
|---|---|---|---|---|
| OSBORN ESTIMATE WORKSHEET | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost; STUDY; ITEM Atrium Plumbing Fixtures | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Water Closet | 13.0 | ea | - | $ - | n | 74 | $ 965.84 | $ 966 | $ 1,062 | $ 1,254 |
| Remove Existing Urinal | 3.0 | ea | - | $ - | n | 74 | $ 222.89 | $ 223 | $ 245 | $ 289 |
| Remove Existing Lavatory | 9.0 | ea | - | $ - | n | 65 | $ 585.00 | $ 585 | $ 644 | $ 759 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Water Closet - Wall Hung | 13.0 | ea | 705.00 | $ 9,165 | n | 179 | $ 2,331.36 | $ 11,496 | $ 12,646 | $ 14,922 |
| Water Closet Flush Valve | 13.0 | ea | 159.00 | $ 2,067 | n | 65 | $ 845.00 | $ 2,912 | $ 3,203 | $ 3,780 |
| New Urinal - Water Saving | 3.0 | ea | 690.00 | $ 2,070 | n | 347 | $ 1,039.94 | $ 3,110 | $ 3,421 | $ 4,037 |
| Urinal Flush Valve | 3.0 | ea | 126.00 | $ 378 | n | 65 | $ 195.00 | $ 573 | $ 630 | $ 744 |
| New Lavatory - Vanity Top | 9.0 | ea | 325.00 | $ 2,925 | n | 163 | $ 1,462.50 | $ 4,388 | $ 4,826 | $ 5,695 |
| Lavatory Faucet | 9.0 | ea | 131.00 | $ 1,179 | n | 52 | $ 468.00 | $ 1,647 | $ 1,812 | $ 2,138 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 17,784** | | | **$ 8,116** | **$ 25,900** | **$ 28,489** | **$ 33,618** |

# APPENDIX E: JAIL I COST ESTIMATES

| | | | | |
|---|---|---|---|---|
| ESTIMATE WORKSHEET | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>Facility Assessment<br>Cleveland, Ohio | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>Summary by Sheet | |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | Labor Rate:<br>$ 65.00 | DATE<br>12/11/13 | SHEET NO. 1 OF 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|
| COST SUMMARY BY SHEET | | | | | | | | | |
| Occupancy Sensors | | | $31,875 | | | $14,950 | $46,825 | $51,508 | $60,779 |
| Garage Heat Recovery & CO Control | | | $229,478 | | | $137,203 | $366,681 | $403,349 | $475,952 |
| Variable Primary Pumps | | | $245,592 | | | $132,676 | $378,268 | $416,094 | $490,991 |
| LED Lighting Upgrade | | | $777,932 | | | $578,454 | $1,356,386 | $1,492,025 | $1,760,589 |
| Garage LED Lighting | | | $43,657 | | | $14,188 | $57,845 | $63,629 | $75,083 |
| Façade Maintenance | | | $490,320 | | | $0 | $490,320 | $539,352 | $636,435 |
| VAV with Advanced Controls | | | $4,071,117 | | | $1,352,769 | $5,423,886 | $5,966,274 | $7,040,204 |
| Roof Replacement | | | $286,425 | | | $329,496 | $615,921 | $677,513 | $799,465 |
| SUBTOTAL 1 | | | $6,176,395 | | | $2,559,737 | $8,736,131 | $9,609,744 | $11,339,498 |
| GENERAL CONDITIONS | 10% | | | | | | $873,613 | | |
| SUBTOTAL 2 | | | | | | | $9,609,744 | | |
| ESCALATION TO MIDPOINT OF CONSTRUCTION | 0.00% | | | | | | $0 | | |
| SUBTOTAL 3 | | | | | | | $9,609,744 | | |
| DESIGN CONTINGENCY | 0% | | | | | | $0 | | |
| ECCA (Estimated Construction Cost at Award) | | | | | | | $9,609,744 | | |
| ARCHITECTURAL FEES | 8% | | | | | | $768,780 | | |
| CONSTRUCTION CONTINGENCY | 10% | | | | | | $960,974 | | |
| CONSTRUCTION MANAGEMENT FEE | 0% | | | | | | $0 | | |
| | | | | | | TOTAL CONSTRUCTION COST | $ 11,339,498 | | |

## ECM-1: Occupancy Sensors

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>Occupancy Sensors | |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 175.0 | ea | 125.00 | $ 21,875 | n | 72 | $ 12,512.50 | $ 34,388 | $ 37,826 | $ 44,635 |
| Wall Occupancy Sensor (1 per office) | 125.0 | ea | 80.00 | $ 10,000.00 | n | 20 | $ 2,437.50 | $ 12,438 | $ 13,681 | $ 16,144 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 31,875** | | | **$ 14,950** | **$ 46,825** | **$ 51,508** | **$ 60,779** |

## ECM-2: Garage Heat Recovery & CO Control

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>Garage Heat Recovery & CO Control | |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Heating & Vent Units | 50000.0 | cfm | - | $ - | n | 0 | $ 19,825 | $ 19,825 | $ 21,808 | $ 25,733 |
| | | | - | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Heating & Vent Units | 50,000 | cfm | 4.00 | $ 200,000.00 | n | 1.63 | $ 81,250 | $ 281,250 | $ 309,375 | $ 365,063 |
| Garage CO2 Sensors | 59.0 | ea | 500.00 | $ 29,477.50 | n | 260 | $ 15,328 | $ 44,806 | $ 49,286 | $ 58,158 |
| Test / Check & Start Up | 2.0 | ea | 0.00 | $ - | n | 5200 | $ 10,400 | $ 10,400 | $ 11,440 | $ 13,499 |
| Commissioning | 2.0 | ea | 0 | $ - | n | 5200 | $ 10,400 | $ 10,400 | $ 11,440 | $ 13,499 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 229,478** | | | **$ 137,203** | **$ 366,681** | **$ 403,349** | **$ 475,952** |

## ECM-3: Variable Primary Pumps

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 09/23/13 | PROJECT NO.: J20130278 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: Variable Primary Pumps | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** *0.40* | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Pumps up to 5 HP | 18.0 | ea | - | $ - | n | 173 | $ 3,120.39 | $ 3,120 | $ 3,432 | $ 4,050 |
| Remove Existing Pumps 7.5-15 HP | 6.0 | ea | - | $ - | n | 416 | $ 2,496.00 | $ 2,496 | $ 2,746 | $ 3,240 |
| Remove Existing Pumps 30-60 HP | 0.0 | ea | - | $ - | n | 1950 | $ - | $ - | $ - | $ - |
| Remove Existing Pumps 75-100 HP | 1.2 | ea | - | $ - | n | 2600 | $ 3,120.00 | $ 3,120 | $ 3,432 | $ 4,050 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Heating Hot Water Pumps - (2) 40 HP | 80.0 | hp | 545.00 | $ 43,600.00 | n | 195 | $ 15,600.00 | $ 59,200 | $ 65,120 | $ 76,842 |
| Chilled Water Pumps - (3) 100 HP | 120.0 | hp | 545.00 | $ 65,400.00 | n | 195 | $ 23,400.00 | $ 88,800 | $ 97,680 | $ 115,262 |
| Air Separator | 1.6 | ea | 15,000.00 | $ 24,000.00 | n | 1040 | $ 1,664.00 | $ 25,664 | $ 28,230 | $ 33,312 |
| Expansion Tank & City Water Piping | 1.6 | ea | 10,000.00 | $ 16,000.00 | n | 1040 | $ 1,664.00 | $ 17,664 | $ 19,430 | $ 22,928 |
| Heating Plant VFDs - (2) 40 hp | 80.0 | hp | 150.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Cooling Plant VFDs - (3) 100 hp | 120.0 | hp | 150.00 | $ 18,000.00 | n | 0 | $ - | $ 18,000 | $ 19,800 | $ 23,364 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PIPING** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 12" SCH 40 CS Pipe - Welded | 30.0 | lft | 87.50 | $ 2,625.00 | n | 82 | $ 2,462.85 | $ 5,088 | $ 5,597 | $ 6,604 |
| 12" Elbows | 2.4 | ea | 590.00 | $ 1,416.00 | n | 624 | $ 1,497.60 | $ 2,914 | $ 3,205 | $ 3,782 |
| 12" Tees | 2.4 | ea | 975.00 | $ 2,340.00 | n | 975 | $ 2,340.00 | $ 4,680 | $ 5,148 | $ 6,075 |
| 12" Butterfly Valves | 2.4 | ea | 1050.00 | $ 2,520.00 | n | 520 | $ 1,248.00 | $ 3,768 | $ 4,145 | $ 4,891 |
| 10" SCH 40 CS Pipe - Welded | 75.0 | lft | 67.00 | $ 5,025.00 | n | 65 | $ 4,875.00 | $ 9,900 | $ 10,890 | $ 12,850 |
| 10" Elbows | 6.0 | ea | 400.00 | $ 2,400.00 | n | 520 | $ 3,120.00 | $ 5,520 | $ 6,072 | $ 7,165 |
| 10" Tees | 6.0 | ea | 695.00 | $ 4,170.00 | n | 780 | $ 4,680.00 | $ 8,850 | $ 9,735 | $ 11,487 |
| 10" Butterfly Valves | 6.0 | ea | 715.00 | $ 4,290.00 | n | 390 | $ 2,340.00 | $ 6,630 | $ 7,293 | $ 8,606 |
| 3-Inch Sch 40 Steel Pipe | 600.0 | lft | 19.50 | $ 11,700.00 | n | 24 | $ 14,508.00 | $ 26,208 | $ 28,829 | $ 34,018 |
| 3-inch BW Steel Elbows | 48.0 | ea | 29.00 | $ 1,392.00 | n | 149 | $ 7,132.32 | $ 8,524 | $ 9,377 | $ 11,065 |
| 3-inch BW Steel Tees | 48.0 | ea | 84.00 | $ 4,032.00 | n | 260 | $ 12,480.00 | $ 16,512 | $ 18,163 | $ 21,433 |
| 3-inch Butterfly Valves | 24.0 | ea | 96.50 | $ 2,316.00 | n | 130 | $ 3,120.00 | $ 5,436 | $ 5,980 | $ 7,056 |
| Thermometers | 25.2 | ea | 75.00 | $ 1,890.00 | n | 16 | $ 409.50 | $ 2,300 | $ 2,529 | $ 2,985 |
| Pressure Gauges | 25.2 | ea | 35.00 | $ 882.00 | n | 16 | $ 409.50 | $ 1,292 | $ 1,421 | $ 1,676 |
| Insulation | 705.0 | lft | 1.41 | $ 994.05 | n | 5 | $ 3,666.00 | $ 4,660 | $ 5,126 | $ 6,049 |
| | | | | | | | | | | |
| Motor Connections | 3.0 | ea | 225.00 | $ 675.00 | n | 520 | $ 1,560.00 | $ 2,235 | $ 2,459 | $ 2,901 |
| Conduits and Feeders | 300.0 | lft | 24.00 | $ 7,200.00 | n | 16 | $ 4,875.00 | $ 12,075 | $ 13,283 | $ 15,673 |
| MCC Pump Breakers | 3.0 | ea | 3,575.00 | $ 10,725.00 | n | 163 | $ 487.50 | $ 11,213 | $ 12,334 | $ 14,554 |
| Programming | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Test / Check & Start Up | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Balancing / Commissioning | 1.0 | ea | - | $ - | n | 5200 | $ 5,200.00 | $ 5,200 | $ 5,720 | $ 6,750 |
| | | | | $245,592.05 | | | **$132,675.66** | **$ 378,268** | **$ 416,094** | **$ 490,991** |

## ECM-4: LED Lighting Upgrade

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>LED Lighting Upgrade | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove and Dispose Existing Lights | 18,147 | lamps | 2.75 | $ 49,905 | n | 10 | $176,936.75 | $ 226,842 | $ 249,526 | $ 294,441 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 2x2 LED Lighting Fixture | 4,412 | ea | 165.00 | $ 728,026 | n | 91 | $401,517.62 | $ 1,129,544 | $ 1,242,498 | $ 1,466,148 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 777,932** | | | **$ 578,454** | **$ 1,356,386** | **$ 1,492,025** | **$ 1,760,589** |

## ECM-5: Garage LED Lighting

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>Garage LED Lighting | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 70W LED Flood Light | 109 | ea | 400.00 | $ 43,657 | n | 130 | $ 14,188 | $ 57,845 | $ 63,629 | $ 75,083 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 43,657** | | | **$ 14,188** | **$ 57,845** | **$ 63,629** | **$ 75,083** |

## ECM-6: Facade Maintenance

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost; ITEM Façade Maintenance | STUDY |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Old Joint Sealant | 0.0 | lf | - | $ - | n | 1 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Caulking/sealant on Façade Joints | 19481.4 | lf | 7.00 | $ 136,370 | n | 0 | $ - | $ 136,370 | $ 150,007 | $ 177,008 |
| Apply Cement Water Repellents | 76945.7 | sf | 4.60 | $ 353,950 | n | 0 | $ - | $ 353,950 | $ 389,345 | $ 459,427 |
| | | | | **$ 490,320** | | | **$ -** | **$ 490,320** | **$ 539,352** | **$ 636,435** |

## ECM-7: VAV with Advanced Controls

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>VAV with Advanced Controls | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove AHUs (AC-1 to 6, AC-13 to 16) | 880.0 | tons | - | $ - | n | 98 | $ 85,800 | $ 85,800 | $ 94,380 | $ 111,368 |
| Remove Window Induction Units | 340.0 | ea | - | $ - | n | 65 | $ 22,100 | $ 22,100 | $ 24,310 | $ 28,686 |
| Remove VAV Boxes | 381.0 | ea | - | $ - | n | 130 | $ 49,530 | $ 49,530 | $ 54,483 | $ 64,290 |
| Remove SA Ductwork | 1.0 | ea | - | $ - | n | 52000 | $ 52,000 | $ 52,000 | $ 57,200 | $ 67,496 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Air Handler (4 Total Units) | 223,000 | cfm | 4.50 | $ 1,003,500.00 | n | 1.63 | $ 362,375 | $ 1,365,875 | $ 1,502,463 | $ 1,772,906 |
| Connect SA, RA, EA Ductwotk | 4.00 | ea | 50000 | $ 200,000.00 | n | 5200 | $ 20,800 | $ 220,800 | $ 242,880 | $ 286,598 |
| Chilled Water Branch Piping | 4.00 | ea | 25000 | $ 100,000.00 | n | 10400 | $ 41,600 | $ 141,600 | $ 155,760 | $ 183,797 |
| Chilled Water Branch Piping | 4.00 | ea | 25000 | $ 100,000.00 | n | 10400 | $ 41,600 | $ 141,600 | $ 155,760 | $ 183,797 |
| Heating Hot Water Branch Piping | 4.00 | ea | 15000 | $ 60,000.00 | n | 7800 | $ 31,200 | $ 91,200 | $ 100,320 | $ 118,378 |
| SAF Variable Speed Drive | 610.00 | hp | 150 | $ 91,500.00 | n | 0 | $ - | $ 91,500 | $ 100,650 | $ 118,767 |
| RAF Variable Speed Drive | 135.00 | hp | 150 | $ 20,250.00 | n | 0 | $ - | $ 20,250 | $ 22,275 | $ 26,285 |
| Test / Check & Start Up | 4.0 | ea | 0.00 | $ - | n | 3900 | $ 15,600 | $ 15,600 | $ 17,160 | $ 20,249 |
| Balancing | 4.0 | ea | 0.00 | $ - | n | 6500 | $ 26,000 | $ 26,000 | $ 28,600 | $ 33,748 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **AIR DISTRIBUTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Single Duct VAV Boxes | 434 | ea | 1750 | $ 759,500.00 | n | 260 | $ 112,840 | $ 872,340 | $ 959,574 | $ 1,132,297 |
| Rework Branch Ductwork Upstream of VAV | 10,416 | lbs | 2.5 | $ 26,040.00 | n | 3 | $ 33,852 | $ 59,892 | $ 65,881 | $ 77,740 |
| Install New SA Dist Duct Downstream of V/ | 10,416 | lbs | 2.0 | $ 20,832.00 | n | 3 | $ 33,852 | $ 54,684 | $ 60,152 | $ 70,980 |
| Install New RGD's | 1,736 | ea | 75 | $ 130,200.00 | n | 65 | $ 112,840 | $ 243,040 | $ 267,344 | $ 315,466 |
| Control Wiring | 434 | ea | 25 | $ 10,850.00 | n | 16 | $ 7,053 | $ 17,903 | $ 19,693 | $ 23,237 |
| Temperature Sensor | 434 | ea | 100 | $ 43,400.00 | n | 16 | $ 7,053 | $ 50,453 | $ 55,498 | $ 65,487 |
| Programming & Graphics | 434 | ea | 0 | $ - | n | 16 | $ 7,053 | $ 7,053 | $ 7,758 | $ 9,154 |
| Balance VAVs | 434 | ea | 0 | $ - | n | 33 | $ 14,105 | $ 14,105 | $ 15,516 | $ 18,308 |
| Balance RGD's | 1,736 | ea | 0 | $ - | n | 16 | $ 28,210 | $ 28,210 | $ 31,031 | $ 36,617 |
| Balance HW Coils | 0 | ea | 0 | $ - | n | 33 | $ - | $ - | $ - | $ - |
| Test / Check / Start Up | 434 | ea | 0 | $ - | n | 33 | $ 14,105 | $ 14,105 | $ 15,516 | $ 18,308 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Duct Mains - Horizontal | 133,740 | lbs | 6 | $ 802,440.00 | n | 0 | $ - | $ 802,440 | $ 882,684 | $ 1,041,567 |
| New Duct Mains - Risers | 0 | lbs | 10 | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PERIMETER HEAT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Perimeter Heat (BBD + Piping) | 340.00 | ea | 500 | $ 170,000.00 | n | 260 | $ 88,400 | $ 258,400 | $ 284,240 | $ 335,403 |
| Install 3/4" (avg size) 2-way Control Valves | 170.00 | ea | 175 | $ 29,750.00 | n | 28 | $ 4,740 | $ 34,490 | $ 37,939 | $ 44,769 |
| Balance Perimter Heat | 340.0 | | - | $ - | n | 33 | $ 11,050 | $ 11,050 | $ 12,155 | $ 14,343 |
| Test / Check / Start Up | 10 | floors | 0 | $ - | n | 1040 | $ 10,400 | $ 10,400 | $ 11,440 | $ 13,499 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ELECTRICAL** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| MCC Breakers - 225 amps 211.97 | 4.0 | ea | $ 1,675 | $ 6,700.00 | n | 130 | $ 520 | $ 7,220 | $ 7,942 | $ 9,372 |
| Motor Connections (200 HP) | 4.0 | ea | $ 500 | $ 2,000.00 | n | 1040 | $ 4,160 | $ 6,160 | $ 6,776 | $ 7,996 |
| Conduit and Feeders | 400.0 | lft | $ 41 | $ 16,200.00 | n | 26 | $ 10,400 | $ 26,600 | $ 29,260 | $ 34,527 |
| MCC Breakers - 100 amps 79.49 | 4.0 | ea | $ 950 | $ 3,800.00 | n | 130 | $ 520 | $ 4,320 | $ 4,752 | $ 5,607 |
| Motor Connections (75 HP) | 4.0 | ea | $ 125 | $ 500.00 | n | 390 | $ 1,560 | $ 2,060 | $ 2,266 | $ 2,674 |
| Conduit and Feeders | 400.0 | lft | $ 11 | $ 4,520.00 | n | 14 | $ 5,720 | $ 10,240 | $ 11,264 | $ 13,292 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Manlift / Scaffold / Chainfalls, etc | 1.0 | | 15000 | $ 15,000.00 | n | 0 | $ - | $ 15,000 | $ 16,500 | $ 19,470 |
| Commissioning | 1.0 | ls | 150000 | $ 150,000.00 | n | 0 | $ - | $ 150,000 | $ 165,000 | $ 194,700 |
| | | | | **$ 3,766,982** | | | **$ 1,257,037** | **$ 5,024,019** | **$ 5,526,421** | **$ 6,521,177** |

## ECM-7: VAV with Advanced Controls (Continued)

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost; ITEM VAV with Advanced Controls | STUDY |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 2 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **BAS FRONT END** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Operator Workstation | 1.0 | ea | 2,500.00 | $ 2,500.00 | n | 0 | $ - | $ 2,500 | $ 2,750 | $ 3,245 |
| Printer | 1.0 | ea | 250.00 | $ 250.00 | n | 0 | $ - | $ 250 | $ 275 | $ 325 |
| Software | 1.0 | ls | 10,000.00 | $ 10,000.00 | n | 0 | $ - | $ 10,000 | $ 11,000 | $ 12,980 |
| Graphics Package | 1.0 | ea | 5,000.00 | $ 5,000.00 | n | 0 | $ - | $ 5,000 | $ 5,500 | $ 6,490 |
| LAN | 1.0 | ls | 100,000 | $ 100,000.00 | n | 0 | $ - | $ 100,000 | $ 110,000 | $ 129,800 |
| NAE | 4.0 | ea | 10,000 | $ 40,000.00 | n | 1040 | $ 4,160.00 | $ 44,160 | $ 48,576 | $ 57,320 |
| Utility Metering | 1.0 | ls | 50,000.00 | $ 50,000.00 | n | 0 | $ - | $ 50,000 | $ 55,000 | $ 64,900 |
| Web Browser | 1.0 | ea | 12,000.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Set Up Building Schedules | 15.0 | ea | - | $ - | n | 130 | $ 1,950.00 | $ 1,950 | $ 2,145 | $ 2,531 |
| Set Up AHU Schedules | 4.0 | ea | - | $ - | n | 130 | $ 520.00 | $ 520 | $ 572 | $ 675 |
| Programming, Testing, Commissioning | 1.0 | ls | - | $ - | n | 10400 | $ 10,400.00 | $ 10,400 | $ 11,440 | $ 13,499 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **GLOBAL POINTS** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| OA Temperature Transmitter - GLOBAL | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| OA Humidity Transmitter - GLOBAL | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| OA CO2 | 2.0 | ea | 500.00 | $ 1,000.00 | n | 65 | $ 130.00 | $ 1,130 | $ 1,243 | $ 1,467 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **DEMAND CONTROL VENTILATION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **CRITICAL ZONE RESET** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ZONE LEVEL UNOCCUPIED SETBACK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 175.0 | ea | | $ - | n | 72 | $ 12,512.50 | $ 12,513 | $ 13,764 | $ 16,241 |
| Wall Occupancy Sensor (1 per office) | 125.0 | ea | | $ - | n | 20 | $ 2,437.50 | $ 2,438 | $ 2,681 | $ 3,164 |
| Existing Occ Sensor - Replace or Tie-In | 0.0 | ea | | $ - | n | 72 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 221,650** | | | **$ 40,170** | **$ 261,820** | **$ 288,002** | **$ 339,842** |

## ECM-7: VAV with Advanced Controls (Continued)

| OSBORN ENGINEERING ESTIMATE WORKSHEET | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
|---|---|---|---|---|
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 3 of 3 |

| DESCRIPTION OF WORK | QUANTITY | | MATERIAL | | LABOR | | | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| | NO. UNITS | UNIT MEAS. | PER UNIT | SUBTOTAL | OT (y/n) | PER UNIT | SUBTOTAL | | | |
| **AIR HANDLERS** *4* | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Space Temperature Transmitters | 0.0 | ea | 225.00 | $ - | n | 65 | $ - | $ - | $ - | $ - |
| Discharge Air Temperature Transmitters | 4.0 | ea | 225.00 | $ 900 | n | 65 | $ 260.00 | $ 1,160 | $ 1,276 | $ 1,506 |
| SA Duct Smoke Detector | 4.0 | ea | 350.00 | $ 1,400 | n | 260 | $ 1,040.00 | $ 2,440 | $ 2,684 | $ 3,167 |
| SA Fan Start / Stop | 4.0 | ea | 500.00 | $ 2,000 | n | 520 | $ 2,080.00 | $ 4,080 | $ 4,488 | $ 5,296 |
| SA Fan Current Sensor | 4.0 | ea | 200.00 | $ 800 | n | 130 | $ 520.00 | $ 1,320 | $ 1,452 | $ 1,713 |
| SA Fan Air Flow Stations | 4.0 | ea | 2500.00 | $ 10,000 | n | 520 | $ 2,080.00 | $ 12,080 | $ 13,288 | $ 15,680 |
| 4-inch, 2-Way Modulating CW Control Valv | 4.0 | ea | 3500.00 | $ 14,000.00 | n | 1040 | $ 4,160.00 | $ 18,160 | $ 19,976 | $ 23,572 |
| Low Limit Temperature Sensor | 4.0 | ea | 250.00 | $ 1,000.00 | n | 260 | $ 1,040.00 | $ 2,040 | $ 2,244 | $ 2,648 |
| Steam Control Valves | 4.0 | ea | 750.00 | $ 3,000.00 | n | 260 | $ 1,040.00 | $ 4,040 | $ 4,444 | $ 5,244 |
| Mixed Air Temperature Transmitters | 4.0 | ea | 225.00 | $ 900.00 | n | 65 | $ 260.00 | $ 1,160 | $ 1,276 | $ 1,506 |
| Differential Pressure Transmitters - Air | 4.0 | ea | 170.00 | $ 680.00 | n | 130 | $ 520.00 | $ 1,200 | $ 1,320 | $ 1,558 |
| OA Damper w/ Actuator | 4.0 | ea | 300.00 | $ 1,200.00 | n | 260 | $ 1,040.00 | $ 2,240 | $ 2,464 | $ 2,908 |
| OA Air Flow Stations | 4.0 | ea | 2,500.00 | $ 10,000.00 | n | 520 | $ 2,080.00 | $ 12,080 | $ 13,288 | $ 15,680 |
| Relief Air Damper w/ Actuator | 4.0 | ea | 300.00 | $ 1,200.00 | n | 260 | $ 1,040.00 | $ 2,240 | $ 2,464 | $ 2,908 |
| RA Damper w/ Actuator | 4.0 | ea | 300.00 | $ 1,200.00 | n | 260 | $ 1,040.00 | $ 2,240 | $ 2,464 | $ 2,908 |
| RA Duct Smoke Detector | 4.0 | ea | 350.00 | $ 1,400.00 | n | 260 | $ 1,040.00 | $ 2,440 | $ 2,684 | $ 3,167 |
| RA Temperature Transmitter | 4.0 | ea | 225.00 | $ 900.00 | n | 65 | $ 260.00 | $ 1,160 | $ 1,276 | $ 1,506 |
| RA Humidity Transmitter | 4.0 | ea | 225.00 | $ 900.00 | n | 65 | $ 260.00 | $ 1,160 | $ 1,276 | $ 1,506 |
| RA CO2 | 4.0 | ea | 500.00 | $ 2,000.00 | n | 260 | $ 1,040.00 | $ 3,040 | $ 3,344 | $ 3,946 |
| RA Fan Start / Stop | 4.0 | ea | 500.00 | $ 2,000.00 | n | 520 | $ 2,080.00 | $ 4,080 | $ 4,488 | $ 5,296 |
| RA Fan Current Sensor | 4.0 | ea | 200.00 | $ 800.00 | n | 130 | $ 520.00 | $ 1,320 | $ 1,452 | $ 1,713 |
| RA Fan Air Flow Stations | 4.0 | ea | 2,500.00 | $ 10,000.00 | n | 520 | $ 2,080.00 | $ 12,080 | $ 13,288 | $ 15,680 |
| Terminations | 168.0 | ea | 0.10 | $ 16.80 | n | 7 | $ 1,092.00 | $ 1,109 | $ 1,220 | $ 1,439 |
| Control Wiring | 2100.0 | lft | 0.20 | $ 420.00 | n | 3 | $ 6,825.00 | $ 7,245 | $ 7,970 | $ 9,404 |
| Conduit | 420.0 | lft | 0.40 | $ 168.00 | n | 3 | $ 1,365.00 | $ 1,533 | $ 1,686 | $ 1,990 |
| 120 Volt Feeder - 20 Amp | 4.0 | ea | 350.00 | $ 1,400.00 | n | 520 | $ 2,080.00 | $ 3,480 | $ 3,828 | $ 4,517 |
| Transformers | 8.0 | ea | 250.00 | $ 2,000.00 | n | 260 | $ 2,080.00 | $ 4,080 | $ 4,488 | $ 5,296 |
| 24 Volt Wiring | 4.0 | ea | 50.00 | $ 200.00 | n | 260 | $ 1,040.00 | $ 1,240 | $ 1,364 | $ 1,610 |
| AHU Controller | 4.0 | ea | 2,500.00 | $ 10,000.00 | n | 260 | $ 1,040.00 | $ 11,040 | $ 12,144 | $ 14,330 |
| Tie-In To BAS | 4.0 | ea | 500.00 | $ 2,000.00 | n | 1560 | $ 6,240.00 | $ 8,240 | $ 9,064 | $ 10,696 |
| Programming | 4.0 | ea | - | $ - | n | 1040 | $ 4,160.00 | $ 4,160 | $ 4,576 | $ 5,400 |
| Graphics | 4.0 | ea | - | $ - | n | 520 | $ 2,080.00 | $ 2,080 | $ 2,288 | $ 2,700 |
| Test, Comissioning, Start Up | 4.0 | ea | - | $ - | n | 520 | $ 2,080.00 | $ 2,080 | $ 2,288 | $ 2,700 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 82,485** | | | **$ 55,562** | **$ 138,047** | **$ 151,851** | **$ 179,185** |

## ECM-8: Roof Replacement

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING<br>**ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>Roof Replacement | |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Roof - 47,269 sf | 1.0 | ls | 500.00 | $ 500 | n | 30725 | $ 30,724.85 | $ 31,225 | $ 34,347 | $ 40,530 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Patch Roof Deck | 47269.0 | sf | 2.00 | $ 94,538 | n | 3 | $153,624.25 | $ 248,162 | $ 272,978 | $ 322,115 |
| Insulation - (2)2.5-inch polyiso | 47269.0 | sf | 2.02 | $ 95,483.38 | n | 1 | $ 49,159.76 | $ 144,643 | $ 159,107 | $ 187,747 |
| EPDM Membrane | 47269.0 | sf | 1.50 | $ 70,903.50 | n | 2 | $ 76,812.13 | $ 147,716 | $ 162,487 | $ 191,735 |
| Lift Existing HVAC Units | 0.0 | ls | 2500.00 | $ - | n | 2600 | $ - | $ - | $ - | $ - |
| Flashing - Against Wall | 450.0 | sf | 10.00 | $ 4,500.00 | n | 7 | $ 2,925.00 | $ 7,425 | $ 8,168 | $ 9,638 |
| Flashing - Roof Edge | 1600.0 | sf | 10.00 | $ 16,000.00 | n | 7 | $ 10,400.00 | $ 26,400 | $ 29,040 | $ 34,267 |
| Flashing - Roof Curbs | 0.0 | sf | 10.00 | $ - | n | 7 | $ - | $ - | $ - | $ - |
| Pitch Pockets / Tall Cone Flashing | 45.0 | ea | 100.00 | $ 4,500.00 | n | 130 | $ 5,850.00 | $ 10,350 | $ 11,385 | $ 13,434 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 286,425** | | | **$ 329,496** | **$ 615,921** | **$ 677,513** | **$ 799,465** |

# APPENDIX F: JAIL II COST ESTIMATES

| | | | | |
|---|---|---|---|---|
| ESTIMATE WORKSHEET | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>Facility Assessment<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>Summary by Sheet | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | Labor Rate:<br>$ 65.00 | DATE<br>12/11/13 | SHEET NO. 1 OF 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|
| COST SUMMARY BY SHEET | | | | | | | | | |
| Occupancy Sensors | | | $26,950 | | | $13,052 | $40,002 | $44,002 | $51,923 |
| LED Lighting Upgrade | | | $254,327 | | | $167,221 | $421,548 | $463,703 | $547,170 |
| VAV with Advanced Controls | | | $2,255,851 | | | $664,102 | $2,919,953 | $3,211,948 | $3,790,099 |
| Variable Speed Pumps | | | $141,769 | | | $74,173 | $215,942 | $237,536 | $280,293 |
| Roof Replacement | | | $144,518 | | | $162,260 | $306,779 | $337,456 | $398,199 |
| SUBTOTAL 1 | | | $2,823,415 | | | $1,080,808 | $3,904,224 | $4,294,646 | $5,067,682 |
| GENERAL CONDITIONS | 10% | | | | | | $390,422 | | |
| SUBTOTAL 2 | | | | | | | $4,294,646 | | |
| ESCALATION TO MIDPOINT OF CONSTRUCTION | 0.00% | | | | | | $0 | | |
| SUBTOTAL 3 | | | | | | | $4,294,646 | | |
| DESIGN CONTINGENCY | 0% | | | | | | $0 | | |
| ECCA (Estimated Construction Cost at Award) | | | | | | | $4,294,646 | | |
| ARCHITECTURAL FEES | 8% | | | | | | $343,572 | | |
| CONSTRUCTION CONTINGENCY | 10% | | | | | | $429,465 | | |
| CONSTRUCTION MANAGEMENT FEE | 0% | | | | | | $0 | | |
| TOTAL CONSTRUCTION COST | | | | | | | $ 5,067,682 | | |

## ECM-1: Occupancy Sensors

| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | | PROJECT NO. J20120380 | CONTRACT NO. |
|---|---|---|---|---|---|
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>Occupancy Sensors | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 | |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 158.0 | ea | 125.00 | $ 19,750 | n | 72 | $ 11,297.00 | $ 31,047 | $ 34,152 | $ 40,299 |
| Wall Occupancy Sensor (1 per office) | 90.0 | ea | 80.00 | $ 7,200.00 | n | 20 | $ 1,755.00 | $ 8,955 | $ 9,851 | $ 11,624 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 26,950** | | | **$ 13,052** | **$ 40,002** | **$ 44,002** | **$ 51,923** |

## ECM-2: LED Lighting Upgrade

| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | | PROJECT NO. J20120380 | CONTRACT NO. |
|---|---|---|---|---|---|
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>LED Lighting Upgrade | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 | |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove and Dispose Existing Lights | 3,274 | lamps | 2.75 | $ 9,004 | n | 10 | $ 31,921.50 | $ 40,925 | $ 45,018 | $ 53,121 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 2x2 LED Lighting Fixture | 1,487 | ea | 165.00 | $ 245,324 | n | 91 | $135,299.76 | $ 380,623 | $ 418,686 | $ 494,049 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 254,327** | | | **$ 167,221** | **$ 421,548** | **$ 463,703** | **$ 547,170** |

## ECM-3: VAV with Advanced Controls

| ESTIMATE WORKSHEET | ORIGINATING OFFICE | DATE SUBMITTED | PROJECT NO. | CONTRACT NO. |
|---|---|---|---|---|
| | Cleveland | 12/11/13 | J20120380 | |
| | PROJECT AND CITY | | PURPOSE | STUDY |
| | Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | Estimated Project Cost | |
| | | | ITEM | |
| | | | VAV with Advanced Controls | |

| ESTIMATE VALID TO: | ESTIMATED BY: | LABOR RATE: | DATE | |
|---|---|---|---|---|
| 12/11/14 | CLZ | $65.00 /HR | 12/11/13 | Page 1 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove AHUs (1/4-1, 2/3/6/8/10/12 1&2) | 425.0 | tons | - | $ - | n | 98 | $ 41,438 | $ 41,438 | $ 45,581 | $ 53,786 |
| Remove Fan-Powered Boxes | 10.0 | ea | - | $ - | n | 195 | $ 1,950 | $ 1,950 | $ 2,145 | $ 2,531 |
| Remove VAV Boxes | 9.0 | ea | - | $ - | n | 130 | $ 1,170 | $ 1,170 | $ 1,287 | $ 1,519 |
| Remove SA Ductwork | 1.0 | ea | - | $ - | n | 52000 | $ 52,000 | $ 52,000 | $ 57,200 | $ 67,496 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Air Handler (14 Total Units) | 90,000 | cfm | 4.50 | $ 405,000.00 | n | 1.63 | $ 146,250 | $ 551,250 | $ 606,375 | $ 715,523 |
| Connect SA, RA, EA Ductwotk | 5.00 | ea | 50000 | $ 250,000.00 | n | 5200 | $ 26,000 | $ 276,000 | $ 303,600 | $ 358,248 |
| Chilled Water Branch Piping | 5.00 | ea | 25000 | $ 125,000.00 | n | 10400 | $ 52,000 | $ 177,000 | $ 194,700 | $ 229,746 |
| Chilled Water Branch Piping | 5.00 | ea | 25000 | $ 125,000.00 | n | 10400 | $ 52,000 | $ 177,000 | $ 194,700 | $ 229,746 |
| Heating Hot Water Branch Piping | 5.00 | ea | 15000 | $ 75,000.00 | n | 7800 | $ 39,000 | $ 114,000 | $ 125,400 | $ 147,972 |
| SAF Variable Speed Drive | 185.00 | hp | 150 | $ 27,750.00 | n | 0 | $ - | $ 27,750 | $ 30,525 | $ 36,020 |
| RAF Variable Speed Drive | 25.00 | hp | 150 | $ 3,750.00 | n | 0 | $ - | $ 3,750 | $ 4,125 | $ 4,868 |
| Test / Check & Start Up | 5.0 | ea | 0.00 | $ - | n | 3900 | $ 19,500 | $ 19,500 | $ 21,450 | $ 25,311 |
| Balancing | 5.0 | ea | 0.00 | $ - | n | 6500 | $ 32,500 | $ 32,500 | $ 35,750 | $ 42,185 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **AIR DISTRIBUTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Single Duct VAV Boxes | 117 | ea | 2000 | $ 234,000.00 | n | 260 | $ 30,420 | $ 264,420 | $ 290,862 | $ 343,217 |
| Install Fan Powered Boxes | 10 | ea | 2500 | $ 25,000.00 | n | 390 | $ 3,900 | $ 28,900 | $ 31,790 | $ 37,512 |
| Rework Branch Ductwork Upstream of VAV | 3,048 | lbs | 2.5 | $ 7,620.00 | n | 3 | $ 9,906 | $ 17,526 | $ 19,279 | $ 22,749 |
| Install New SA Dist Duct Downstream of V/ | 0 | lbs | 2.0 | $ - | n | 3 | $ - | $ - | $ - | $ - |
| Install New RGD's | 0 | ea | 75 | $ - | n | 65 | $ - | $ - | $ - | $ - |
| Control Wiring | 127 | ea | 25 | $ 3,175.00 | n | 16 | $ 2,064 | $ 5,239 | $ 5,763 | $ 6,800 |
| Temperature Sensor | 127 | ea | 100 | $ 12,700.00 | n | 16 | $ 2,064 | $ 14,764 | $ 16,240 | $ 19,163 |
| Programming & Graphics | 127 | ea | 0 | $ - | n | 16 | $ 2,064 | $ 2,064 | $ 2,270 | $ 2,679 |
| Balance VAVs | 127 | ea | 0 | $ - | n | 33 | $ 4,128 | $ 4,128 | $ 4,540 | $ 5,357 |
| Balance RGD's | 0 | ea | 0 | $ - | n | 16 | $ - | $ - | $ - | $ - |
| Balance HW Coils | 127 | ea | 0 | $ - | n | 33 | $ 4,128 | $ 4,128 | $ 4,540 | $ 5,357 |
| Test / Check / Start Up | 127 | ea | 0 | $ - | n | 33 | $ 4,128 | $ 4,128 | $ 4,540 | $ 5,357 |
| New Duct Mains - Horizontal SA+RA | 57,600 | lbs | 6 | $ 345,600.00 | n | 0 | $ - | $ 345,600 | $ 380,160 | $ 448,589 |
| New Duct Mains - Risers SA+RA | 4,740 | lbs | 10 | $ 47,400.00 | n | 0 | $ - | $ 47,400 | $ 52,140 | $ 61,525 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PERIMETER HEAT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Perimeter Heat (BBD + Piping) | 0.00 | ea | 500 | $ - | n | 260 | $ - | $ - | $ - | $ - |
| Install 3/4" (avg size) 2-way Control Valves | 0.00 | ea | 175 | $ - | n | 28 | $ - | $ - | $ - | $ - |
| Balance Perimter Heat | 0.0 | | - | $ - | n | 33 | $ - | $ - | $ - | $ - |
| Test / Check / Start Up | 0 | floors | 0 | $ - | n | 1040 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ELECTRICAL** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| MCC Breakers - 225 amps 211.97 | 5.0 | ea | $ 1,675 | $ 8,375.00 | n | 130 | $ 650 | $ 9,025 | $ 9,928 | $ 11,714 |
| Motor Connections (200 HP) | 5.0 | ea | $ 500 | $ 2,500.00 | n | 1040 | $ 5,200 | $ 7,700 | $ 8,470 | $ 9,995 |
| Conduit and Feeders | 500.0 | lft | $ 41 | $ 20,250.00 | n | 26 | $ 13,000 | $ 33,250 | $ 36,575 | $ 43,159 |
| MCC Breakers - 100 amps 79.49 | 5.0 | ea | $ 950 | $ 4,750.00 | n | 130 | $ 650 | $ 5,400 | $ 5,940 | $ 7,009 |
| Motor Connections (75 HP) | 5.0 | ea | $ 125 | $ 625.00 | n | 390 | $ 1,950 | $ 2,575 | $ 2,833 | $ 3,342 |
| Conduit and Feeders | 500.0 | lft | $ 11 | $ 5,650.00 | n | 14 | $ 7,150 | $ 12,800 | $ 14,080 | $ 16,614 |
| Manlift / Scaffold / Chainfalls, etc | 1.0 | | 15000 | $ 15,000.00 | n | 0 | $ - | $ 15,000 | $ 16,500 | $ 19,470 |
| Commissioning | 1.0 | ls | 150000 | $ 150,000.00 | n | 0 | $ - | $ 150,000 | $ 165,000 | $ 194,700 |
| | | | | **$ 1,894,145** | | | **$ 555,207** | **$ 2,449,352** | **$ 2,694,287** | **$ 3,179,259** |

## ECM-3: VAV with Advanced Controls (Continued)

| | | | | |
|---|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE<br>Estimated Project Cost<br>ITEM<br>VAV with Advanced Controls | STUDY |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 2 of 3 |

| DESCRIPTION OF WORK | QUANTITY<br>NO. UNITS | QUANTITY<br>UNIT MEAS. | MATERIAL<br>PER UNIT | MATERIAL<br>SUBTOTAL | LABOR<br>OT (y/n) | LABOR<br>PER UNIT | LABOR<br>SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **BAS FRONT END** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Operator Workstation | 1.0 | ea | 2,500.00 | $ 2,500.00 | n | 0 | $ - | $ 2,500 | $ 2,750 | $ 3,245 |
| Printer | 1.0 | ea | 250.00 | $ 250.00 | n | 0 | $ - | $ 250 | $ 275 | $ 325 |
| Software | 1.0 | ls | 10,000.00 | $ 10,000.00 | n | 0 | $ - | $ 10,000 | $ 11,000 | $ 12,980 |
| Graphics Package | 1.0 | ea | 5,000.00 | $ 5,000.00 | n | 0 | $ - | $ 5,000 | $ 5,500 | $ 6,490 |
| LAN | 1.0 | ls | 100,000 | $ 100,000.00 | n | 0 | $ - | $ 100,000 | $ 110,000 | $ 129,800 |
| NAE | 5.0 | ea | 10,000 | $ 50,000.00 | n | 1040 | $ 5,200.00 | $ 55,200 | $ 60,720 | $ 71,650 |
| Utility Metering | 1.0 | ls | 50,000.00 | $ 50,000.00 | n | 0 | $ - | $ 50,000 | $ 55,000 | $ 64,900 |
| Web Browser | 1.0 | ea | 12,000.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Set Up Building Schedules | 15.0 | ea | - | $ - | n | 130 | $ 1,950.00 | $ 1,950 | $ 2,145 | $ 2,531 |
| Set Up AHU Schedules | 5.0 | ea | - | $ - | n | 130 | $ 650.00 | $ 650 | $ 715 | $ 844 |
| Programming, Testing, Commissioning | 1.0 | ls | - | $ - | n | 10400 | $ 10,400.00 | $ 10,400 | $ 11,440 | $ 13,499 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **GLOBAL POINTS** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| OA Temperature Transmitter - GLOBAL | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| OA Humidity Transmitter - GLOBAL | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| OA CO2 | 2.0 | ea | 500.00 | $ 1,000.00 | n | 65 | $ 130.00 | $ 1,130 | $ 1,243 | $ 1,467 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **DEMAND CONTROL VENTILAITON** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **CRITICAL ZONE RESET** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ZONE LEVEL UNOCCUPIED SETBACK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 158.0 | ea | 125.00 | $ 19,750.00 | n | 72 | $ 11,297.00 | $ 31,047 | $ 34,152 | $ 40,299 |
| Wall Occupancy Sensor (1 per office) | 90.0 | ea | 80.00 | $ 7,200.00 | n | 20 | $ 1,755.00 | $ 8,955 | $ 9,851 | $ 11,624 |
| Existing Occ Sensor - Replace or Tie-In | 0.0 | ea | 80.00 | $ - | n | 72 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 258,600** | | | **$ 39,442** | **$ 298,042** | **$ 327,846** | **$ 386,859** |

## ECM-3: VAV with Advanced Controls (Continued)

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost / ITEM VAV with Advanced Controls | STUDY |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 3 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **AIR HANDLERS** *5* | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Space Temperature Transmitters | 0.0 | ea | 225.00 | $ - | n | 65 | $ - | $ - | $ - | $ - |
| Discharge Air Temperature Transmitters | 5.0 | ea | 225.00 | $ 1,125 | n | 65 | $ 325.00 | $ 1,450 | $ 1,595 | $ 1,882 |
| SA Duct Smoke Detector | 5.0 | ea | 350.00 | $ 1,750 | n | 260 | $ 1,300.00 | $ 3,050 | $ 3,355 | $ 3,959 |
| SA Fan Start / Stop | 5.0 | ea | 500.00 | $ 2,500 | n | 520 | $ 2,600.00 | $ 5,100 | $ 5,610 | $ 6,620 |
| SA Fan Current Sensor | 5.0 | ea | 200.00 | $ 1,000 | n | 130 | $ 650.00 | $ 1,650 | $ 1,815 | $ 2,142 |
| SA Fan Air Flow Stations | 5.0 | ea | 2500.00 | $ 12,500 | n | 520 | $ 2,600.00 | $ 15,100 | $ 16,610 | $ 19,600 |
| 4-inch, 2-Way Modulating CW Control Valv | 5.0 | ea | 3500.00 | $ 17,500.00 | n | 1040 | $ 5,200.00 | $ 22,700 | $ 24,970 | $ 29,465 |
| Low Limit Temperature Sensor | 5.0 | ea | 250.00 | $ 1,250.00 | n | 260 | $ 1,300.00 | $ 2,550 | $ 2,805 | $ 3,310 |
| Steam Control Valves | 5.0 | ea | 750.00 | $ 3,750.00 | n | 260 | $ 1,300.00 | $ 5,050 | $ 5,555 | $ 6,555 |
| Mixed Air Temperature Transmitters | 5.0 | ea | 225.00 | $ 1,125.00 | n | 65 | $ 325.00 | $ 1,450 | $ 1,595 | $ 1,882 |
| Differential Pressure Transmitters - Air | 5.0 | ea | 170.00 | $ 850.00 | n | 130 | $ 650.00 | $ 1,500 | $ 1,650 | $ 1,947 |
| OA Damper w/ Actuator | 5.0 | ea | 300.00 | $ 1,500.00 | n | 260 | $ 1,300.00 | $ 2,800 | $ 3,080 | $ 3,634 |
| OA Air Flow Stations | 5.0 | ea | 2,500.00 | $ 12,500.00 | n | 520 | $ 2,600.00 | $ 15,100 | $ 16,610 | $ 19,600 |
| Relief Air Damper w/ Actuator | 5.0 | ea | 300.00 | $ 1,500.00 | n | 260 | $ 1,300.00 | $ 2,800 | $ 3,080 | $ 3,634 |
| RA Damper w/ Actuator | 5.0 | ea | 300.00 | $ 1,500.00 | n | 260 | $ 1,300.00 | $ 2,800 | $ 3,080 | $ 3,634 |
| RA Duct Smoke Detector | 5.0 | ea | 350.00 | $ 1,750.00 | n | 260 | $ 1,300.00 | $ 3,050 | $ 3,355 | $ 3,959 |
| RA Temperature Transmitter | 5.0 | ea | 225.00 | $ 1,125.00 | n | 65 | $ 325.00 | $ 1,450 | $ 1,595 | $ 1,882 |
| RA Humidity Transmitter | 5.0 | ea | 225.00 | $ 1,125.00 | n | 65 | $ 325.00 | $ 1,450 | $ 1,595 | $ 1,882 |
| RA CO2 | 5.0 | ea | 500.00 | $ 2,500.00 | n | 260 | $ 1,300.00 | $ 3,800 | $ 4,180 | $ 4,932 |
| RA Fan Start / Stop | 5.0 | ea | 500.00 | $ 2,500.00 | n | 520 | $ 2,600.00 | $ 5,100 | $ 5,610 | $ 6,620 |
| RA Fan Current Sensor | 5.0 | ea | 200.00 | $ 1,000.00 | n | 130 | $ 650.00 | $ 1,650 | $ 1,815 | $ 2,142 |
| RA Fan Air Flow Stations | 5.0 | ea | 2,500.00 | $ 12,500.00 | n | 520 | $ 2,600.00 | $ 15,100 | $ 16,610 | $ 19,600 |
| Terminations | 210.0 | ea | 0.10 | $ 21.00 | n | 7 | $ 1,365.00 | $ 1,386 | $ 1,525 | $ 1,799 |
| Control Wiring | 2625.0 | lft | 0.20 | $ 525.00 | n | 3 | $ 8,531.25 | $ 9,056 | $ 9,962 | $ 11,755 |
| Conduit | 525.0 | lft | 0.40 | $ 210.00 | n | 3 | $ 1,706.25 | $ 1,916 | $ 2,108 | $ 2,487 |
| 120 Volt Feeder - 20 Amp | 5.0 | ea | 350.00 | $ 1,750.00 | n | 520 | $ 2,600.00 | $ 4,350 | $ 4,785 | $ 5,646 |
| Transformers | 10.0 | ea | 250.00 | $ 2,500.00 | n | 260 | $ 2,600.00 | $ 5,100 | $ 5,610 | $ 6,620 |
| 24 Volt Wiring | 5.0 | ea | 50.00 | $ 250.00 | n | 260 | $ 1,300.00 | $ 1,550 | $ 1,705 | $ 2,012 |
| AHU Controller | 5.0 | ea | 2,500.00 | $ 12,500.00 | n | 260 | $ 1,300.00 | $ 13,800 | $ 15,180 | $ 17,912 |
| Tie-In To BAS | 5.0 | ea | 500.00 | $ 2,500.00 | n | 1560 | $ 7,800.00 | $ 10,300 | $ 11,330 | $ 13,369 |
| Programming | 5.0 | ea | - | $ - | n | 1040 | $ 5,200.00 | $ 5,200 | $ 5,720 | $ 6,750 |
| Graphics | 5.0 | ea | - | $ - | n | 520 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Test, Comissioning, Start Up | 5.0 | ea | - | $ - | n | 520 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 103,106** | | | **$ 69,453** | **$ 172,559** | **$ 189,814** | **$ 223,981** |

## ECM-4: Variable Speed Pumps

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 09/23/13 | PROJECT NO.: J20130278 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: Variable Speed Pumps | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Pumps up to 5 HP | 0.0 | ea | - | $ - | n | 173 | $ - | $ - | $ - | $ - |
| Remove Existing Pumps 7.5-15 HP | 2.0 | ea | - | $ - | n | 416 | $ 832.00 | $ 832 | $ 915 | $ 1,080 |
| Remove Existing Pumps 30-60 HP | 3.0 | ea | - | $ - | n | 1950 | $ 5,850.00 | $ 5,850 | $ 6,435 | $ 7,593 |
| Remove Existing Pumps 75-100 HP | 0.0 | ea | - | $ - | n | 2600 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Heating Hot Water Pumps - (2) 15 HP | 30.0 | hp | 545.00 | $ 16,350.00 | n | 195 | $ 5,850.00 | $ 22,200 | $ 24,420 | $ 28,816 |
| Chilled Water Pumps - (3) 20 HP | 60.0 | hp | 545.00 | $ 32,700.00 | n | 195 | $ 11,700.00 | $ 44,400 | $ 48,840 | $ 57,631 |
| Air Separator | 2.0 | ea | 4,000.00 | $ 8,000.00 | n | 1040 | $ 2,080.00 | $ 10,080 | $ 11,088 | $ 13,084 |
| Expansion Tank & City Water Piping | 2.0 | ea | 2,500.00 | $ 5,000.00 | n | 1040 | $ 2,080.00 | $ 7,080 | $ 7,788 | $ 9,190 |
| Heating Plant VFDs - (2) 15 hp | 80.0 | hp | 150.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Cooling Plant VFDs - (3) 20 hp | 60.0 | hp | 150.00 | $ 9,000.00 | n | 0 | $ - | $ 9,000 | $ 9,900 | $ 11,682 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PIPING** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 12" SCH 40 CS Pipe - Welded | 75.0 | lft | 87.50 | $ 6,562.50 | n | 82 | $ 6,157.13 | $ 12,720 | $ 13,992 | $ 16,510 |
| 12" Elbows | 6.0 | ea | 590.00 | $ 3,540.00 | n | 624 | $ 3,744.00 | $ 7,284 | $ 8,012 | $ 9,455 |
| 12" Tees | 0.0 | ea | 975.00 | $ - | n | 975 | $ - | $ - | $ - | $ - |
| 12" Butterfly Valves | 6.0 | ea | 1050.00 | $ 6,300.00 | n | 520 | $ 3,120.00 | $ 9,420 | $ 10,362 | $ 12,227 |
| 10" SCH 40 CS Pipe - Welded | 50.0 | lft | 67.00 | $ 3,350.00 | n | 65 | $ 3,250.00 | $ 6,600 | $ 7,260 | $ 8,567 |
| 10" Elbows | 4.0 | ea | 400.00 | $ 1,600.00 | n | 520 | $ 2,080.00 | $ 3,680 | $ 4,048 | $ 4,777 |
| 10" Tees | 4.0 | ea | 695.00 | $ 2,780.00 | n | 780 | $ 3,120.00 | $ 5,900 | $ 6,490 | $ 7,658 |
| 10" Butterfly Valves | 4.0 | ea | 715.00 | $ 2,860.00 | n | 390 | $ 1,560.00 | $ 4,420 | $ 4,862 | $ 5,737 |
| 3-Inch Sch 40 Steel Pipe | 0.0 | lft | 19.50 | $ - | n | 24 | $ - | $ - | $ - | $ - |
| 3-inch BW Steel Elbows | 0.0 | ea | 29.00 | $ - | n | 149 | $ - | $ - | $ - | $ - |
| 3-inch BW Steel Tees | 0.0 | ea | 84.00 | $ - | n | 260 | $ - | $ - | $ - | $ - |
| 3-inch Butterfly Valves | 0.0 | ea | 96.50 | $ - | n | 130 | $ - | $ - | $ - | $ - |
| Thermometers | 5.0 | ea | 75.00 | $ 375.00 | n | 16 | $ 81.25 | $ 456 | $ 502 | $ 592 |
| Pressure Gauges | 5.0 | ea | 35.00 | $ 175.00 | n | 16 | $ 81.25 | $ 256 | $ 282 | $ 333 |
| Insulation | 125.0 | lft | 1.41 | $ 176.25 | n | 5 | $ 650.00 | $ 826 | $ 909 | $ 1,072 |
| | | | | | | | | | | |
| Motor Connections | 5.0 | ea | 225.00 | $ 1,125.00 | n | 520 | $ 2,600.00 | $ 3,725 | $ 4,098 | $ 4,835 |
| Conduits and Feeders | 500.0 | lft | 24.00 | $ 12,000.00 | n | 16 | $ 8,125.00 | $ 20,125 | $ 22,138 | $ 26,122 |
| MCC Pump Breakers | 5.0 | ea | 3,575.00 | $ 17,875.00 | n | 163 | $ 812.50 | $ 18,688 | $ 20,556 | $ 24,256 |
| Programming | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Test / Check & Start Up | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Balancing / Commissioning | 1.0 | ea | - | $ - | n | 5200 | $ 5,200.00 | $ 5,200 | $ 5,720 | $ 6,750 |
| | | | | $141,768.75 | | | **$ 74,173.13** | **$ 215,942** | **$ 237,536** | **$ 280,293** |

## ECM-5: Roof Replacement

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE Cleveland | DATE SUBMITTED 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE Estimated Project Cost | STUDY |
| | | | ITEM Roof Replacement | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Roof - 20,112 sf | 1.0 | ls | 500.00 | $ 500 | n | 13073 | $ 13,072.80 | $ 13,573 | $ 14,930 | $ 17,617 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Patch Roof Deck | 20112.0 | sf | 2.00 | $ 40,224 | n | 3 | $ 65,364.00 | $ 105,588 | $ 116,147 | $ 137,053 |
| Insulation - (2)2.5-inch polyiso | 20112.0 | sf | 2.02 | $ 40,626.24 | n | 1 | $ 20,916.48 | $ 61,543 | $ 67,697 | $ 79,882 |
| EPDM Membrane | 20112.0 | sf | 1.50 | $ 30,168.00 | n | 2 | $ 32,682.00 | $ 62,850 | $ 69,135 | $ 81,579 |
| Lift Existing HVAC Units | 7.0 | ls | 2500.00 | $ 17,500.00 | n | 2600 | $ 18,200.00 | $ 35,700 | $ 39,270 | $ 46,339 |
| Flashing - Against Wall | 250.0 | sf | 10.00 | $ 2,500.00 | n | 7 | $ 1,625.00 | $ 4,125 | $ 4,538 | $ 5,354 |
| Flashing - Roof Edge | 750.0 | sf | 10.00 | $ 7,500.00 | n | 7 | $ 4,875.00 | $ 12,375 | $ 13,613 | $ 16,063 |
| Flashing - Roof Curbs | 250.0 | sf | 10.00 | $ 2,500.00 | n | 7 | $ 1,625.00 | $ 4,125 | $ 4,538 | $ 5,354 |
| Pitch Pockets / Tall Cone Flashing | 30.0 | ea | 100.00 | $ 3,000.00 | n | 130 | $ 3,900.00 | $ 6,900 | $ 7,590 | $ 8,956 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 144,518** | | | **$ 162,260** | **$ 306,779** | **$ 337,456** | **$ 398,199** |

# APPENDIX G: POLICE BUILDING COST ESTIMATES

OSBORN ENGINEERING ESTIMATE WORKSHEET

ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO.:

PROJECT AND CITY: Cuyahoga County Justice Center, Facility Assessment, Cleveland, Ohio | PURPOSE: Estimated Project Cost | STUDY

ITEM: Summary by Sheet

ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | Labor Rate: $ 65.00 | DATE: 12/11/13 | SHEET NO. 1 OF 1

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|
| COST SUMMARY BY SHEET | | | | | | | | | |
| Occupancy Sensors | | | $55,130 | | | $27,963 | $83,093 | $91,402 | $107,855 |
| LED Lighting Upgrade | | | $580,062 | | | $414,761 | $994,823 | $1,094,305 | $1,291,280 |
| Façade Maintenance | | | $271,686 | | | $0 | $271,686 | $298,854 | $352,648 |
| Variable Speed Pumps | | | $183,273 | | | $98,284 | $281,558 | $309,713 | $365,462 |
| VAV with Advanced Controls | | | $1,971,473 | | | $775,122 | $2,746,596 | $3,021,255 | $3,565,081 |
| Garage LED Lighting | | | $73,323 | | | $23,830 | $97,153 | $106,868 | $126,104 |
| Roof Replacement | | | $211,711 | | | $244,088 | $455,799 | $501,379 | $591,627 |
| Police Plumbing Fixtures | | | $138,360 | | | $66,224 | $204,584 | $225,042 | $265,550 |
| SUBTOTAL 1 | | | $3,485,018 | | | $1,650,272 | $5,135,290 | $5,648,819 | $6,665,607 |
| GENERAL CONDITIONS | 10% | | | | | | $513,529 | | |
| SUBTOTAL 2 | | | | | | | $5,648,819 | | |
| ESCALATION TO MIDPOINT OF CONSTRUCTION | 0.00% | | | | | | $0 | | |
| SUBTOTAL 3 | | | | | | | $5,648,819 | | |
| DESIGN CONTINGENCY | 0% | | | | | | $0 | | |
| ECCA (Estimated Construction Cost at Award) | | | | | | | $5,648,819 | | |
| ARCHITECTURAL FEES | 8% | | | | | | $451,906 | | |
| CONSTRUCTION CONTINGENCY | 10% | | | | | | $564,882 | | |
| CONSTRUCTION MANAGEMENT FEE | 0% | | | | | | $0 | | |
| | | | | | | TOTAL CONSTRUCTION COST | $ 6,665,607 | | |

## ECM-1: Occupancy Sensors

OSBORN ENGINEERING **ESTIMATE WORKSHEET**

ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO.:

PROJECT AND CITY: Cuyahoga County Justice Center, **Facility Assessment**, Cleveland, Ohio | PURPOSE: Estimated Project Cost | STUDY

ITEM: Occupancy Sensors

ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 354.0 | ea | 125.00 | $ 44,250 | n | 72 | $ 25,311.00 | $ 69,561 | $ 76,517 | $ 90,290 |
| Wall Occupancy Sensor (1 per office) | 136.0 | ea | 80.00 | $ 10,880.00 | n | 20 | $ 2,652.00 | $ 13,532 | $ 14,885 | $ 17,565 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 55,130** | | | **$ 27,963** | **$ 83,093** | **$ 91,402** | **$ 107,855** |

## ECM-2: LED Lighting Upgrade

| | | | |
|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland; DATE SUBMITTED: 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | PURPOSE: Estimated Project Cost; STUDY | ITEM: LED Lighting Upgrade |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ; LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove and Dispose Existing Lights | 11,520 | lamps | 2.75 | $ 31,680 | n | 10 | $ 112,319 | $ 143,999 | $ 158,399 | $ 186,911 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 2x2 LED Lighting Fixture | 3,324 | ea | 165.00 | $ 548,382 | n | 91 | $ 302,441 | $ 850,823 | $ 935,906 | $ 1,104,369 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 580,062** | | | **$ 414,761** | **$ 994,823** | **$ 1,094,305** | **$ 1,291,280** |

## ECM-3: Facade Maintenance

| | | | |
|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland; DATE SUBMITTED: 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | PURPOSE: Estimated Project Cost; STUDY | ITEM: Façade Maintenance |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ; LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Old Joint Sealant | 0.0 | lf | - | $ - | n | 1 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Caulking/sealant on Façade Joints | 13782.5 | lf | 7.00 | $ 96,478 | n | 0 | $ - | $ 96,478 | $ 106,125 | $ 125,228 |
| Apply Cement Water Repellents | 38088.8 | sf | 4.60 | $ 175,208 | n | 0 | $ - | $ 175,208 | $ 192,729 | $ 227,420 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 271,686** | | | **$ -** | **$ 271,686** | **$ 298,854** | **$ 352,648** |

## ECM-4: Variable Speed Pumps

| | | | |
|---|---|---|---|
| **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland; DATE SUBMITTED: 09/23/13 | PROJECT NO.: J20130278 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center, **Facility Assessment**, Cleveland, Ohio | PURPOSE: Estimated Project Cost | STUDY |
| | | ITEM: Variable Speed Pumps | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ; LABOR RATE: $65.00 /HR; DATE: 12/11/13 | Page 1 of 1 | |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Pumps up to 5 HP | 4.0 | ea | - | $ - | n | 173 | $ 693.42 | $ 693 | $ 763 | $ 900 |
| Remove Existing Pumps 7.5-15 HP | 5.0 | ea | - | $ - | n | 416 | $ 2,080.00 | $ 2,080 | $ 2,288 | $ 2,700 |
| Remove Existing Pumps 30-60 HP | 1.0 | ea | - | $ - | n | 1950 | $ 1,950.00 | $ 1,950 | $ 2,145 | $ 2,531 |
| Remove Existing Pumps 75-100 HP | 0.0 | ea | - | $ - | n | 2600 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Heating Hot Water Pumps - (2) 40 HP | 80.0 | hp | 545.00 | $ 43,600.00 | n | 195 | $ 15,600.00 | $ 59,200 | $ 65,120 | $ 76,842 |
| Chilled Water Pumps - (2) 40 HP | 80.0 | hp | 545.00 | $ 43,600.00 | n | 195 | $ 15,600.00 | $ 59,200 | $ 65,120 | $ 76,842 |
| Air Separator | 2.0 | ea | 4,000.00 | $ 8,000.00 | n | 1040 | $ 2,080.00 | $ 10,080 | $ 11,088 | $ 13,084 |
| Expansion Tank & City Water Piping | 2.0 | ea | 2,500.00 | $ 5,000.00 | n | 1040 | $ 2,080.00 | $ 7,080 | $ 7,788 | $ 9,190 |
| Heating Plant VFDs - (2) 40 hp | 80.0 | hp | 150.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Cooling Plant VFDs - (2) 40 hp | 80.0 | hp | 150.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PIPING** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 12" SCH 40 CS Pipe - Welded | 50.0 | lft | 87.50 | $ 4,375.00 | n | 82 | $ 4,104.75 | $ 8,480 | $ 9,328 | $ 11,007 |
| 12" Elbows | 4.0 | ea | 590.00 | $ 2,360.00 | n | 624 | $ 2,496.00 | $ 4,856 | $ 5,342 | $ 6,303 |
| 12" Tees | 4.0 | ea | 975.00 | $ 3,900.00 | n | 975 | $ 3,900.00 | $ 7,800 | $ 8,580 | $ 10,124 |
| 12" Butterfly Valves | 4.0 | ea | 1050.00 | $ 4,200.00 | n | 520 | $ 2,080.00 | $ 6,280 | $ 6,908 | $ 8,151 |
| 10" SCH 40 CS Pipe - Welded | 50.0 | lft | 67.00 | $ 3,350.00 | n | 65 | $ 3,250.00 | $ 6,600 | $ 7,260 | $ 8,567 |
| 10" Elbows | 4.0 | ea | 400.00 | $ 1,600.00 | n | 520 | $ 2,080.00 | $ 3,680 | $ 4,048 | $ 4,777 |
| 10" Tees | 4.0 | ea | 695.00 | $ 2,780.00 | n | 780 | $ 3,120.00 | $ 5,900 | $ 6,490 | $ 7,658 |
| 10" Butterfly Valves | 4.0 | ea | 715.00 | $ 2,860.00 | n | 390 | $ 1,560.00 | $ 4,420 | $ 4,862 | $ 5,737 |
| 3-Inch Sch 40 Steel Pipe | 225.0 | lft | 19.50 | $ 4,387.50 | n | 24 | $ 5,440.50 | $ 9,828 | $ 10,811 | $ 12,757 |
| 3-inch BW Steel Elbows | 18.0 | ea | 29.00 | $ 522.00 | n | 149 | $ 2,674.62 | $ 3,197 | $ 3,516 | $ 4,149 |
| 3-inch BW Steel Tees | 18.0 | ea | 84.00 | $ 1,512.00 | n | 260 | $ 4,680.00 | $ 6,192 | $ 6,811 | $ 8,037 |
| 3-inch Butterfly Valves | 9.0 | ea | 96.50 | $ 868.50 | n | 130 | $ 1,170.00 | $ 2,039 | $ 2,242 | $ 2,646 |
| Thermometers | 10.0 | ea | 75.00 | $ 750.00 | n | 16 | $ 162.50 | $ 913 | $ 1,004 | $ 1,184 |
| Pressure Gauges | 10.0 | ea | 35.00 | $ 350.00 | n | 16 | $ 162.50 | $ 513 | $ 564 | $ 665 |
| Insulation | 325.0 | lft | 1.41 | $ 458.25 | n | 5 | $ 1,690.00 | $ 2,148 | $ 2,363 | $ 2,788 |
| | | | | | | | | | | |
| Motor Connections | 4.0 | ea | 225.00 | $ 900.00 | n | 520 | $ 2,080.00 | $ 2,980 | $ 3,278 | $ 3,868 |
| Conduits and Feeders | 400.0 | lft | 24.00 | $ 9,600.00 | n | 16 | $ 6,500.00 | $ 16,100 | $ 17,710 | $ 20,898 |
| MCC Pump Breakers | 4.0 | ea | 3,575.00 | $ 14,300.00 | n | 163 | $ 650.00 | $ 14,950 | $ 16,445 | $ 19,405 |
| Programming | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Test / Check & Start Up | 1.0 | ea | - | $ - | n | 2600 | $ 2,600.00 | $ 2,600 | $ 2,860 | $ 3,375 |
| Balancing / Commissioning | 1.0 | ea | - | $ - | n | 5200 | $ 5,200.00 | $ 5,200 | $ 5,720 | $ 6,750 |
| | | | | $183,273.25 | | | **$ 98,284.29** | **$ 281,558** | **$ 309,713** | **$ 365,462** |

## ECM-5: VAV with Advanced Controls

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove AHUs (AC-1 to 6, AC-13 to 16) | 400.0 | tons | - | $ - | n | 98 | $ 39,000 | $ 39,000 | $ 42,900 | $ 50,622 |
| Remove Moduline Units | 798.0 | ea | - | $ - | n | 65 | $ 51,870 | $ 51,870 | $ 57,057 | $ 67,327 |
| Remove VAV Boxes | 15.0 | ea | - | $ - | n | 130 | $ 1,950 | $ 1,950 | $ 2,145 | $ 2,531 |
| Remove SA Ductwork | 1.0 | ea | - | $ - | n | 46800 | $ 46,800 | $ 46,800 | $ 51,480 | $ 60,746 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Air Handler (4 Total Units) | 138,000 | cfm | 4.50 | $ 621,000.00 | n | 1.63 | $ 224,250 | $ 845,250 | $ 929,775 | $ 1,097,135 |
| Connect SA, RA, EA Ductwotk | 2.00 | ea | 50000 | $ 100,000.00 | n | 5200 | $ 10,400 | $ 110,400 | $ 121,440 | $ 143,299 |
| Chilled Water Branch Piping | 2.00 | ea | 25000 | $ 50,000.00 | n | 10400 | $ 20,800 | $ 70,800 | $ 77,880 | $ 91,898 |
| Chilled Water Branch Piping | 2.00 | ea | 25000 | $ 50,000.00 | n | 10400 | $ 20,800 | $ 70,800 | $ 77,880 | $ 91,898 |
| Heating Hot Water Branch Piping | 2.00 | ea | 15000 | $ 30,000.00 | n | 7800 | $ 15,600 | $ 45,600 | $ 50,160 | $ 59,189 |
| SAF Variable Speed Drive | 200.00 | hp | 150 | $ 30,000.00 | n | 0 | $ - | $ 30,000 | $ 33,000 | $ 38,940 |
| RAF Variable Speed Drive | 80.00 | hp | 150 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Test / Check & Start Up | 2.0 | ea | 0.00 | $ - | n | 3900 | $ 7,800 | $ 7,800 | $ 8,580 | $ 10,124 |
| Balancing | 2.0 | ea | 0.00 | $ - | n | 6500 | $ 13,000 | $ 13,000 | $ 14,300 | $ 16,874 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **AIR DISTRIBUTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Single Duct VAV Boxes | 252 | ea | 1750 | $ 441,000.00 | n | 260 | $ 65,520 | $ 506,520 | $ 557,172 | $ 657,463 |
| Rework Branch Ductwork Upstream of VAV | 6,048 | lbs | 2.5 | $ 15,120.00 | n | 3 | $ 19,656 | $ 34,776 | $ 38,254 | $ 45,139 |
| Install New SA Dist Duct Downstream of V/ | 6,048 | lbs | 2.0 | $ 12,096.00 | n | 3 | $ 19,656 | $ 31,752 | $ 34,927 | $ 41,214 |
| Install New RGD's | 1,008 | ea | 75 | $ 75,600.00 | n | 65 | $ 65,520 | $ 141,120 | $ 155,232 | $ 183,174 |
| Control Wiring | 252 | ea | 25 | $ 6,300.00 | n | 16 | $ 4,095 | $ 10,395 | $ 11,435 | $ 13,493 |
| Temperature Sensor | 252 | ea | 100 | $ 25,200.00 | n | 16 | $ 4,095 | $ 29,295 | $ 32,225 | $ 38,025 |
| Programming & Graphics | 252 | ea | 0 | $ - | n | 16 | $ 4,095 | $ 4,095 | $ 4,505 | $ 5,315 |
| Balance VAVs | 252 | ea | 0 | $ - | n | 33 | $ 8,190 | $ 8,190 | $ 9,009 | $ 10,631 |
| Balance RGD's | 1,008 | ea | 0 | $ - | n | 16 | $ 16,380 | $ 16,380 | $ 18,018 | $ 21,261 |
| Balance HW Coils | 0 | ea | 0 | $ - | n | 33 | $ - | $ - | $ - | $ - |
| Test / Check / Start Up | 252 | ea | 0 | $ - | n | 33 | $ 8,190 | $ 8,190 | $ 9,009 | $ 10,631 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Duct Mains - Horizontal | 0 | lbs | 6 | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Duct Mains - Risers | 0 | lbs | 10 | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **PERIMETER HEAT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Install Perimeter Heat (BBD + Piping) | 0.00 | ea | 500 | $ - | n | 260 | $ - | $ - | $ - | $ - |
| Install 3/4" (avg size) 2-way Control Valves | 133.00 | ea | 175 | $ 23,275.00 | n | 28 | $ 3,709 | $ 26,984 | $ 29,682 | $ 35,025 |
| Balance Perimter Heat | 133.0 | | - | $ - | n | 33 | $ 4,323 | $ 4,323 | $ 4,755 | $ 5,611 |
| Test / Check / Start Up | 9 | floors | 0 | $ - | n | 1040 | $ 9,360 | $ 9,360 | $ 10,296 | $ 12,149 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ELECTRICAL** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| MCC Breakers - 225 amps 211.97 | 2.0 | ea | $ 1,675 | $ 3,350.00 | n | 130 | $ 260 | $ 3,610 | $ 3,971 | $ 4,686 |
| Motor Connections (200 HP) | 2.0 | ea | $ 500 | $ 1,000.00 | n | 1040 | $ 2,080 | $ 3,080 | $ 3,388 | $ 3,998 |
| Conduit and Feeders | 200.0 | lft | $ 41 | $ 8,100.00 | n | 26 | $ 5,200 | $ 13,300 | $ 14,630 | $ 17,263 |
| MCC Breakers - 100 amps 79.49 | 2.0 | ea | $ 950 | $ 1,900.00 | n | 130 | $ 260 | $ 2,160 | $ 2,376 | $ 2,804 |
| Motor Connections (75 HP) | 2.0 | ea | $ 125 | $ 250.00 | n | 390 | $ 780 | $ 1,030 | $ 1,133 | $ 1,337 |
| Conduit and Feeders | 200.0 | lft | $ 11 | $ 2,260.00 | n | 14 | $ 2,860 | $ 5,120 | $ 5,632 | $ 6,646 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Manlift / Scaffold / Chainfalls, etc | 1.0 | | 15000 | $ 15,000.00 | n | 0 | $ - | $ 15,000 | $ 16,500 | $ 19,470 |
| Commissioning | 1.0 | ls | 150000 | $ 150,000.00 | n | 0 | $ - | $ 150,000 | $ 165,000 | $ 194,700 |
| | | | | **$ 1,673,451** | | | **$ 696,498** | **$ 2,369,949** | **$ 2,606,944** | **$ 3,076,194** |

## ECM-5: VAV with Advanced Controls (Continued)

| OSBORN ESTIMATE WORKSHEET | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
|---|---|---|---|---|
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 2 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **BAS FRONT END** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Operator Workstation | 1.0 | ea | 2,500.00 | $ 2,500.00 | n | 0 | $ - | $ 2,500 | $ 2,750 | $ 3,245 |
| Printer | 1.0 | ea | 250.00 | $ 250.00 | n | 0 | $ - | $ 250 | $ 275 | $ 325 |
| Software | 1.0 | ls | 10,000.00 | $ 10,000.00 | n | 0 | $ - | $ 10,000 | $ 11,000 | $ 12,980 |
| Graphics Package | 1.0 | ea | 5,000.00 | $ 5,000.00 | n | 0 | $ - | $ 5,000 | $ 5,500 | $ 6,490 |
| LAN | 1.0 | ls | 100,000 | $ 100,000.00 | n | 0 | $ - | $ 100,000 | $ 110,000 | $ 129,800 |
| NAE | 2.0 | ea | 10,000 | $ 20,000.00 | n | 1040 | $ 2,080.00 | $ 22,080 | $ 24,288 | $ 28,660 |
| Utility Metering | 1.0 | ls | 50,000.00 | $ 50,000.00 | n | 0 | $ - | $ 50,000 | $ 55,000 | $ 64,900 |
| Web Browser | 1.0 | ea | 12,000.00 | $ 12,000.00 | n | 0 | $ - | $ 12,000 | $ 13,200 | $ 15,576 |
| Set Up Building Schedules | 15.0 | ea | - | $ - | n | 130 | $ 1,950.00 | $ 1,950 | $ 2,145 | $ 2,531 |
| Set Up AHU Schedules | 2.0 | ea | - | $ - | n | 130 | $ 260.00 | $ 260 | $ 286 | $ 337 |
| Programming, Testing, Commissioning | 1.0 | ls | - | $ - | n | 10400 | $ 10,400.00 | $ 10,400 | $ 11,440 | $ 13,499 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **GLOBAL POINTS** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| OA Temperature Transmitter - GLOBAL | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| OA Humidity Transmitter - GLOBAL | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| OA CO2 | 2.0 | ea | 500.00 | $ 1,000.00 | n | 65 | $ 130.00 | $ 1,130 | $ 1,243 | $ 1,467 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **DEMAND CONTROL VENTILATION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **CRITICAL ZONE RESET** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **ZONE LEVEL UNOCCUPIED SETBACK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Ceiling Occupancy Sensor (1 per 500 sf) | 354.0 | ea | 125.00 | $ 44,250.00 | n | 72 | $ 25,311.00 | $ 69,561 | $ 76,517 | $ 90,290 |
| Wall Occupancy Sensor (1 per office) | 136.0 | ea | 80.00 | $ 10,880.00 | n | 20 | $ 2,652.00 | $ 13,532 | $ 14,885 | $ 17,565 |
| Existing Occ Sensor - Replace or Tie-In | 0.0 | ea | 80.00 | $ - | n | 72 | $ - | $ - | $ - | $ - |
| Programming | 1.0 | ea | - | $ - | n | 1560 | $ 1,560.00 | $ 1,560 | $ 1,716 | $ 2,025 |
| Test, Comissioning, Start Up | 1.0 | ea | - | $ - | n | 1040 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 256,780** | | | **$ 50,843** | **$ 307,623** | **$ 338,385** | **$ 399,295** |

## ECM-5: VAV with Advanced Controls (Continued)

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO. J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: VAV with Advanced Controls | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE 12/11/13 | Page 3 of 3 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **AIR HANDLERS** *2* | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Space Temperature Transmitters | 0.0 | ea | 225.00 | $ - | n | 65 | $ - | $ - | $ - | $ - |
| Discharge Air Temperature Transmitters | 2.0 | ea | 225.00 | $ 450 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| SA Duct Smoke Detector | 2.0 | ea | 350.00 | $ 700 | n | 260 | $ 520.00 | $ 1,220 | $ 1,342 | $ 1,584 |
| SA Fan Start / Stop | 2.0 | ea | 500.00 | $ 1,000 | n | 520 | $ 1,040.00 | $ 2,040 | $ 2,244 | $ 2,648 |
| SA Fan Current Sensor | 2.0 | ea | 200.00 | $ 400 | n | 130 | $ 260.00 | $ 660 | $ 726 | $ 857 |
| SA Fan Air Flow Stations | 2.0 | ea | 2500.00 | $ 5,000 | n | 520 | $ 1,040.00 | $ 6,040 | $ 6,644 | $ 7,840 |
| 4-inch, 2-Way Modulating CW Control Valv | 2.0 | ea | 3500.00 | $ 7,000.00 | n | 1040 | $ 2,080.00 | $ 9,080 | $ 9,988 | $ 11,786 |
| Low Limit Temperature Sensor | 2.0 | ea | 250.00 | $ 500.00 | n | 260 | $ 520.00 | $ 1,020 | $ 1,122 | $ 1,324 |
| Steam Control Valves | 2.0 | ea | 750.00 | $ 1,500.00 | n | 260 | $ 520.00 | $ 2,020 | $ 2,222 | $ 2,622 |
| Mixed Air Temperature Transmitters | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| Differential Pressure Transmitters - Air | 2.0 | ea | 170.00 | $ 340.00 | n | 130 | $ 260.00 | $ 600 | $ 660 | $ 779 |
| OA Damper w/ Actuator | 2.0 | ea | 300.00 | $ 600.00 | n | 260 | $ 520.00 | $ 1,120 | $ 1,232 | $ 1,454 |
| OA Air Flow Stations | 2.0 | ea | 2,500.00 | $ 5,000.00 | n | 520 | $ 1,040.00 | $ 6,040 | $ 6,644 | $ 7,840 |
| Relief Air Damper w/ Actuator | 2.0 | ea | 300.00 | $ 600.00 | n | 260 | $ 520.00 | $ 1,120 | $ 1,232 | $ 1,454 |
| RA Damper w/ Actuator | 2.0 | ea | 300.00 | $ 600.00 | n | 260 | $ 520.00 | $ 1,120 | $ 1,232 | $ 1,454 |
| RA Duct Smoke Detector | 2.0 | ea | 350.00 | $ 700.00 | n | 260 | $ 520.00 | $ 1,220 | $ 1,342 | $ 1,584 |
| RA Temperature Transmitter | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| RA Humidity Transmitter | 2.0 | ea | 225.00 | $ 450.00 | n | 65 | $ 130.00 | $ 580 | $ 638 | $ 753 |
| RA CO2 | 2.0 | ea | 500.00 | $ 1,000.00 | n | 260 | $ 520.00 | $ 1,520 | $ 1,672 | $ 1,973 |
| RA Fan Start / Stop | 2.0 | ea | 500.00 | $ 1,000.00 | n | 520 | $ 1,040.00 | $ 2,040 | $ 2,244 | $ 2,648 |
| RA Fan Current Sensor | 2.0 | ea | 200.00 | $ 400.00 | n | 130 | $ 260.00 | $ 660 | $ 726 | $ 857 |
| RA Fan Air Flow Stations | 2.0 | ea | 2,500.00 | $ 5,000.00 | n | 520 | $ 1,040.00 | $ 6,040 | $ 6,644 | $ 7,840 |
| Terminations | 84.0 | ea | 0.10 | $ 8.40 | n | 7 | $ 546.00 | $ 554 | $ 610 | $ 720 |
| Control Wiring | 1050.0 | lft | 0.20 | $ 210.00 | n | 3 | $ 3,412.50 | $ 3,623 | $ 3,985 | $ 4,702 |
| Conduit | 210.0 | lft | 0.40 | $ 84.00 | n | 3 | $ 682.50 | $ 767 | $ 843 | $ 995 |
| 120 Volt Feeder - 20 Amp | 2.0 | ea | 350.00 | $ 700.00 | n | 520 | $ 1,040.00 | $ 1,740 | $ 1,914 | $ 2,259 |
| Transformers | 4.0 | ea | 250.00 | $ 1,000.00 | n | 260 | $ 1,040.00 | $ 2,040 | $ 2,244 | $ 2,648 |
| 24 Volt Wiring | 2.0 | ea | 50.00 | $ 100.00 | n | 260 | $ 520.00 | $ 620 | $ 682 | $ 805 |
| AHU Controller | 2.0 | ea | 2,500.00 | $ 5,000.00 | n | 260 | $ 520.00 | $ 5,520 | $ 6,072 | $ 7,165 |
| Tie-In To BAS | 2.0 | ea | 500.00 | $ 1,000.00 | n | 1560 | $ 3,120.00 | $ 4,120 | $ 4,532 | $ 5,348 |
| Programming | 2.0 | ea | - | $ - | n | 1040 | $ 2,080.00 | $ 2,080 | $ 2,288 | $ 2,700 |
| Graphics | 2.0 | ea | - | $ - | n | 520 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| Test, Comissioning, Start Up | 2.0 | ea | - | $ - | n | 520 | $ 1,040.00 | $ 1,040 | $ 1,144 | $ 1,350 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 41,242** | | | **$ 27,781** | **$ 69,023** | **$ 75,926** | **$ 89,592** |

## ECM-6: Garage LED Lighting

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: Garage LED Lighting | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **EQUIPMENT** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| 70W LED Flood Light | 183 | ea | 400.00 | $ 73,323 | n | 130 | $ 23,830 | $ 97,153 | $ 106,868 | $ 126,104 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 73,323** | | | **$ 23,830** | **$ 97,153** | **$ 106,868** | **$ 126,104** |

## ECM-7: Roof Replacement

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE: Cleveland | DATE SUBMITTED: 12/11/13 | PROJECT NO.: J20120380 | CONTRACT NO. |
| | PROJECT AND CITY: Cuyahoga County Justice Center **Facility Assessment** Cleveland, Ohio | | PURPOSE: Estimated Project Cost | STUDY |
| | | | ITEM: Roof Replacement | |
| ESTIMATE VALID TO: 12/11/14 | ESTIMATED BY: CLZ | LABOR RATE: $65.00 /HR | DATE: 12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Roof - 35,002 sf | 1.0 | ls | 500.00 | $ 500 | n | 22751 | $ 22,751.30 | $ 23,251 | $ 25,576 | $ 30,180 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Patch Roof Deck | 35002.0 | sf | 2.00 | $ 70,004 | n | 3 | $113,756.50 | $ 183,761 | $ 202,137 | $ 238,521 |
| Insulation - (2)2.5-inch polyiso | 35002.0 | sf | 2.02 | $ 70,704.04 | n | 1 | $ 36,402.08 | $ 107,106 | $ 117,817 | $ 139,024 |
| EPDM Membrane | 35002.0 | sf | 1.50 | $ 52,503.00 | n | 2 | $ 56,878.25 | $ 109,381 | $ 120,319 | $ 141,977 |
| Lift Existing HVAC Units | 2.0 | ls | 2500.00 | $ 5,000.00 | n | 2600 | $ 5,200.00 | $ 10,200 | $ 11,220 | $ 13,240 |
| Flashing - Against Wall | 300.0 | sf | 10.00 | $ 3,000.00 | n | 7 | $ 1,950.00 | $ 4,950 | $ 5,445 | $ 6,425 |
| Flashing - Roof Edge | 800.0 | sf | 10.00 | $ 8,000.00 | n | 7 | $ 5,200.00 | $ 13,200 | $ 14,520 | $ 17,134 |
| Flashing - Roof Curbs | 100.0 | sf | 10.00 | $ 1,000.00 | n | 7 | $ 650.00 | $ 1,650 | $ 1,815 | $ 2,142 |
| Pitch Pockets / Tall Cone Flashing | 10.0 | ea | 100.00 | $ 1,000.00 | n | 130 | $ 1,300.00 | $ 2,300 | $ 2,530 | $ 2,985 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 211,711** | | | **$ 244,088** | **$ 455,799** | **$ 501,379** | **$ 591,627** |

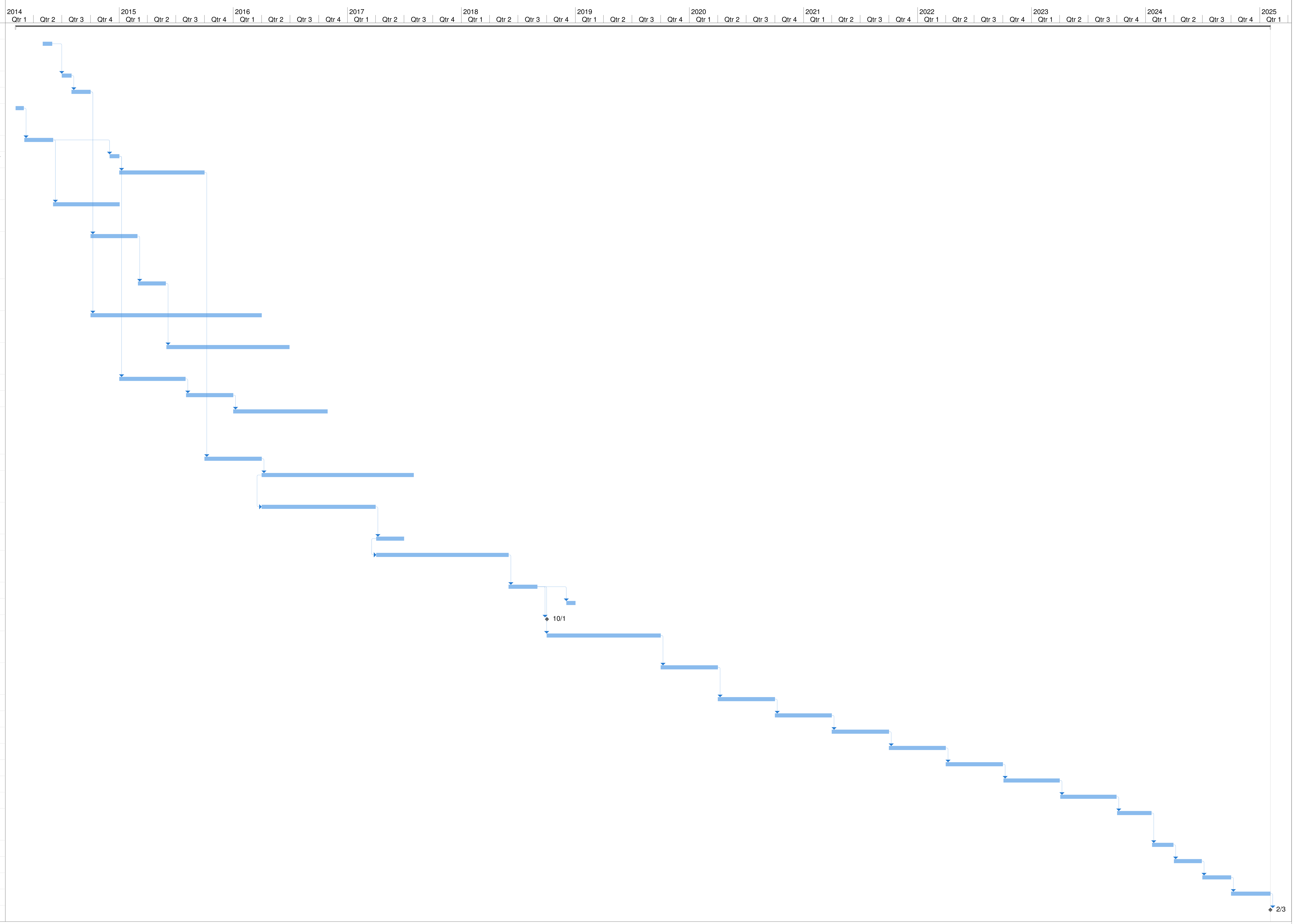
## Police Plumbing Fixtures

| | | | | |
|---|---|---|---|---|
| OSBORN ENGINEERING **ESTIMATE WORKSHEET** | ORIGINATING OFFICE<br>Cleveland | DATE SUBMITTED<br>12/11/13 | PROJECT NO.<br>J20120380 | CONTRACT NO. |
| | PROJECT AND CITY<br>Cuyahoga County Justice Center<br>**Facility Assessment**<br>Cleveland, Ohio | | PURPOSE STUDY<br>Estimated Project Cost<br>ITEM<br>Police Plumbing Fixtures | |
| ESTIMATE VALID TO:<br>12/11/14 | ESTIMATED BY:<br>CLZ | LABOR RATE:<br>$65.00 /HR | DATE<br>12/11/13 | Page 1 of 1 |

| DESCRIPTION OF WORK | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL PER UNIT | MATERIAL SUBTOTAL | LABOR OT (y/n) | LABOR PER UNIT | LABOR SUBTOTAL | SUBTOTALS | ECCA | EXTENDED |
|---|---|---|---|---|---|---|---|---|---|---|
| **DEMOLTION** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| Remove Existing Water Closet | 86.0 | ea | - | $ - | n | 74 | $ 6,389.37 | $ 6,389 | $ 7,028 | $ 8,293 |
| Remove Existing Urinal | 31.0 | ea | - | $ - | n | 74 | $ 2,303.15 | $ 2,303 | $ 2,533 | $ 2,989 |
| Remove Existing Lavatory | 85.0 | ea | - | $ - | n | 65 | $ 5,525.00 | $ 5,525 | $ 6,078 | $ 7,171 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| **NEW WORK** | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| New Water Closet - Wall Hung | 86.0 | ea | 705.00 | $ 60,630 | n | 179 | $ 15,422.81 | $ 76,053 | $ 83,658 | $ 98,717 |
| Water Closet Flush Valve | 86.0 | ea | 159.00 | $ 13,674 | n | 65 | $ 5,590.00 | $ 19,264 | $ 21,190 | $ 25,005 |
| New Urinal - Water Saving | 31.0 | ea | 690.00 | $ 21,390 | n | 347 | $ 10,746.00 | $ 32,136 | $ 35,350 | $ 41,713 |
| Urinal Flush Valve | 31.0 | ea | 126.00 | $ 3,906 | n | 65 | $ 2,015.00 | $ 5,921 | $ 6,513 | $ 7,685 |
| New Lavatory - Vanity Top | 85.0 | ea | 325.00 | $ 27,625 | n | 163 | $ 13,812.50 | $ 41,438 | $ 45,581 | $ 53,786 |
| Lavatory Faucet | 85.0 | ea | 131.00 | $ 11,135 | n | 52 | $ 4,420.00 | $ 15,555 | $ 17,111 | $ 20,190 |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | $ - | n | 0 | $ - | $ - | $ - | $ - |
| | | | | **$ 138,360** | | | **$ 66,224** | **$ 204,584** | **$ 225,042** | **$ 265,550** |

# Appendix M
# Program

| ID | Task Mode | Task Name | Duration | Start | Finish |
|---|---|---|---|---|---|
| 1 | | Cuyahoga Co. Justice Cente | 2871 days | Mon 2/3/14 | Mon 2/3/25 |
| 2 | | RFP for A/E on Police Building work | 22 days | Thu 5/1/14 | Fri 5/30/14 |
| 3 | | A/E selection by City | 23 days | Tue 7/1/14 | Thu 7/31/14 |
| 4 | | A/E contract with City | 43 days | Fri 8/1/14 | Tue 9/30/14 |
| 5 | | RFP for A/E on County Justice Center work | 20 days | Mon 2/3/14 | Fri 2/28/14 |
| 6 | | A/E selection by City | 66 days | Mon 3/3/14 | Mon 6/2/14 |
| 7 | | A/E contract with County | 23 days | Mon 12/1/14 | Wed 12/31/14 |
| 8 | | Central booking design and courts tower - phase 1 work | 195 days | Thu 1/1/15 | Wed 9/30/15 |
| 9 | | Move Police records and relocate museum | 153 days | Tue 6/3/14 | Thu 1/1/15 |
| 10 | | Police building design complete (floors 6-9 and new building) | 108 days | Wed 10/1/14 | Fri 2/27/15 |
| 11 | | Bid and award / consolidate police to lower levels | 65 days | Mon 3/2/15 | Fri 5/29/15 |
| 12 | | New police building construction at firing range | 392 days | Wed 10/1/14 | Thu 3/31/16 |
| 13 | | Renovate floors 6-9 police building | 282 days | Mon 6/1/15 | Tue 6/28/16 |
| 14 | | MEP Systems Design | 152 days | Thu 1/1/15 | Fri 7/31/15 |
| 15 | | Bid & Award | 109 days | Mon 8/3/15 | Thu 12/31/15 |
| 16 | | Floor 5 and 24 - MEP equipment replacement in courts tower | 216 days | Fri 1/1/16 | Fri 10/28/16 |
| 17 | | Bid & Award | 131 days | Thu 10/1/15 | Thu 3/31/16 |
| 18 | | Central booking in ten corrections center (jail 1) | 347 days | Fri 4/1/16 | Mon 7/31/17 |
| 19 | | Renovate floors 7, 8, and 9. Relocate housing court | 261 days | Fri 4/1/16 | Fri 3/31/17 |
| 20 | | Move in | 65 days | Mon 4/3/17 | Fri 6/30/17 |
| 21 | | Renovation floors 1-4 (police building) | 304 days | Mon 4/3/17 | Thu 5/31/18 |
| 22 | | Move in | 66 days | Fri 6/1/18 | Fri 8/31/18 |
| 23 | | Terminate all leases | 21 days | Mon 12/3/18 | Mon 12/31/18 |
| 24 | | Start courts floors | 0 days | Mon 10/1/18 | Mon 10/1/18 |
| 25 | | Floors 6, 7, 8, and 9 (swing space renovation) | 261 days | Mon 10/1/18 | Mon 9/30/19 |
| 26 | | Floors 10-11 (in to new courts) | 131 days | Tue 10/1/19 | Tue 3/31/20 |
| 27 | | Floors 23-22 | 131 days | Wed 4/1/20 | Wed 9/30/20 |
| 28 | | Floors 21-20 | 130 days | Thu 10/1/20 | Wed 3/31/21 |
| 29 | | Floors 19-18 | 131 days | Thu 4/1/21 | Thu 9/30/21 |
| 30 | | Floors 17-16 | 130 days | Fri 10/1/21 | Thu 3/31/22 |
| 31 | | Floors 15-14 | 131 days | Fri 4/1/22 | Fri 9/30/22 |
| 32 | | Floors 13-12 | 130 days | Mon 10/3/22 | Fri 3/31/23 |
| 33 | | Floor 9 | 130 days | Mon 4/3/23 | Fri 9/29/23 |
| 34 | | Floor 1 (expand jury area and cafeteria to atrium) | 80 days | Mon 10/2/23 | Fri 1/19/24 |
| 35 | | Floor 4 | 50 days | Mon 1/22/24 | Fri 3/29/24 |
| 36 | | Floor 9 | 65 days | Mon 4/1/24 | Fri 6/28/24 |
| 37 | | Floor 2 | 66 days | Mon 7/1/24 | Mon 9/30/24 |
| 38 | | Floor 3 | 90 days | Tue 10/1/24 | Mon 2/3/25 |
| 39 | | Program Completion | 0 days | Mon 2/3/25 | Mon 2/3/25 |




Project: 131217_CCJC
Date: Tue 12/17/13

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress