

**Park Pavilion
Shelter and Restroom Facility Study
Site-Built vs. Pre-Fabricated
Structure Comparison**

For:
**City of Appleton
Parks, Recreation and Facilities Management
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1. **Background / Overview:**

Chet Wesenberg Architect, LLC was initially contacted by the City of Appleton in regards to developing Design Concepts for a Park Pavilion Prototype to be considered in Appletons' neighborhood parks. Currently, there are eight parks in the city lacking permanent restroom facilities. The designs were primarily tailored for Summit Park, with the thought that the selected design, or a variation of it, can easily be adapted for use in other neighborhood parks.

Through discussions with Parks, Recreation and Facilities Management, and considering the size and frequency of use of the parks presently lacking facilities, it was determined that a facility with two water closets for each the Mens' and Womens' toilet rooms would be appropriate. Two fixtures, in addition to handling the anticipated use, allows for continued use of the facility in the event that one of the fixtures requires maintenance. Since parks are typically frequented by families with young children whom often require assistance, options to include a family-use toilet room have also been considered. In addition to restroom facilities, the pavilion program includes an exterior sheltered area which would provide the city with rentable space for private functions.

To accompany the aforementioned design presentation, CWA has conducted this study to compare the benefits of Pre-Fabricated Restroom Facilities to those of Traditional Site-Built Construction.

Comparing the benefits of installing a pre-fabricated structure to those of a traditional site-built facility requires an understanding of the design and construction processes of each, and of the design criteria regarding Park Pavilions.

2. Design and Construction Methods:

Site-Built Process:

The traditional site-built process begins with acquiring an architect. Services normally provided by the architect include preliminary design, design development, construction documentation, bidding and construction administration. For each phase, the typical responsibilities of the architect include:

- Preliminary Design / Design Development:
 - Collaborate with client to establish a design program, requested design criteria and construction budget.
 - Analyze the project priorities based on building function, aesthetics, and site related conditions.
 - Create design customized to specific criteria formulated by the combination of client, site and building priorities.
 - Provide probable construction cost for implementation of the design.
- Construction Documentation:
 - Create drawing set and project manual for purposes of ensuring sound and proper construction, soliciting multiple competitive bids for construction, and submitting building documentation to the state governing authority for plan review approval as required to obtain a building permit.
- Bidding Administration:
 - Provide the aforementioned construction documents to various contractors to obtain bids.
 - Clarify/answer contractor questions regarding the project and document set.
 - Obtain construction bids and make contractor recommendation based on qualifications and bid results.
- Construction Administration:
 - Administer periodic construction progress meetings with contractor and client to aid in maintaining proper construction.
 - Review materials and equipment submitted by the contractor to ensure compliance with standards set by construction documents.
 - Review and process contractor requests for payment. Evaluate construction progress and quality to date prior to authorizing periodic payments.
 - Evaluate project to verify completion prior to releasing final payment.

Commonly, the processes are aided and guided by contract documents developed by the American Institute of Architects to define the responsibilities of each party. These documents were developed based on experiences of countless past projects and formulated to both reduce potential problems and to provide means to resolve conflicts.

Pre-Fabricated Process:

There are several companies that offer Pre-Fabricated Restroom Structures, including:

- Green Flush Technologies
- CXT, Inc.- an LB Foster Company
- Public Restroom Company
- Quality Precast, Inc.- an Easi-Set Builders Company
- CorWorth Innovative Buildings

For the purposes of this study, most research was based on correspondence with Green Flush Technologies, CXT Inc, and Quality Precast Inc.

The process to install a Pre-Fabricated Structure is typically done via direct owner/client contact with a selected Structure Manufacturer. Once a manufacturer has been selected, the client coordinates directly with the company to establish a building design, along with fixture, material and equipment selections.

The company then creates the documents necessary for submittals to, and approvals from, the state to obtain applicable permits. The building is subsequently fabricated by the company, usually within a controlled warehouse environment. When fabrication is complete, the pre-fabricated unit is delivered via truck to the site for installation. Utilities and excavation required prior to the structure's arrival are typically arranged by the client and outsourced to a separate contractor. The structure, upon arrival, is then normally placed via crane into the designated location. Generally, for the final building installation, the pre-fabricated structure company has a crew on site to set the facility into a site that has been previously prepared.

In both the site-built and pre-fabricated structure process, neither the architect or pre-fabricated building manufacturer services typically include site surveying, utility design to the building, or if required, stormwater management design. These services would be obtained by the client as needed under separate contracts. If requested by the client, in the site-built process, the architect can obtain the services of a civil engineer to include the utility and storm water management design.

3. Pavilion Design Criteria:

Public Parks provide valuable open green spaces in urban areas that neighborhood residents would not otherwise have access to. Their facilities offer gathering spaces for families and social groups of all ages, cultures and economic status. Park spaces have positive recreational, environmental and social impacts critical to the welfare of communities.

Unfortunately, while these vast and largely unrestricted open spaces impart intrinsic benefits, these same traits create challenges. Two primary criteria to be addressed in Pavilion design include safety/security and cost.

Safety / Security:

Open spaces that have limited access restrictions foster ideal conditions to harbor negative activities such as vandalism, lewd and lascivious behavior, harassment and other unlawful acts. Establishing a constant law enforcement presence to monitor and discourage adverse activities can be over-bearing and not economically practical. Due to this, Pavilions should be designed with a reasonable effort to avoid contributing to conditions conducive to detrimental conduct. Three elements to be considered to promote a safe environment include visibility, access, and notification.

- Visibility:

Pavilion layout, orientation, and location in a park should minimize areas hidden from visibility. Areas visible from public sidewalks and streets not only help deter unlawful acts but contribute to a perceived sense of security from park users to promote a more comfortable and relaxed experience. Also, areas visible from other locations within the park help caretakers monitor children.

- Access:

As stated earlier, one of the primary purposes of a park is to offer usage and amenities to everyone. Though access should be available to all, most constructive park activities occur during certain time frames of each day. Negative activities are more likely to occur at times when the park is less frequently used and offers less surveillance. Concealed interior rooms of a park pavilion do not allow for visibility by others as a means to deter improper conduct. Due to the size of a park, it is difficult to completely restrict access, but it is not difficult to restrict access to the Park Pavilion restrooms. For these difficult to monitor areas, locking the building and preventing use should be considered for the less frequently used time periods.

- Notification / Surveillance:

In addition to maintaining site lines for visible areas as a deterrent, cameras can also be located to monitor activity. Much like maintaining visibility, the presence of cameras not only act to deter unlawful activities but also contribute to a perceived sense of security for the park users. In addition to cameras, an emergency call system can be installed with a direct connection to security companies or the police department.

Cost:

Being a government-owned amenity made available to promote the overall welfare of the community, parks do not typically generate revenue to sustain themselves, but rather rely on the tax base. When evaluating the cost of park pavilions, criteria to be considered includes:

- Design Cost
- Construction Cost
- Durability
- Maintenance

The initial short-term design and construction fees associated with erecting a Park Pavilion are apparent, but maintenance and upkeep costs need to be considered as well. Making a sheltered area of a Pavilion available for rent can contribute to its financial sustainability, but the long-term benefits of designing durable and easily-maintained construction materials and equipment should not be overlooked.

For increased durability, both Pre-Fabricated and Site-Built Facilities are capable of concrete wall construction in lieu of wood frame stud framing.

Regarding maintenance and upkeep, both facility types can include a vault- or tank- in lieu of connection to a municipal sanitary system. Some pre-fab manufacturers offer additional options for waterless facilities, with an additional option to utilize solar panels to omit the need for an electrical feed. While these amenities have advantages that are especially useful in remote locations that do not have utility infrastructure nearby to support the building, Appleton parks are typically within reasonable proximity to utilities. Due to the availability of municipal utilities, and the desire to reduce maintenance costs incurred with the occasional need to empty the vault, we concluded the non-vaulted restroom facilities which utilize available utilities to be more maintenance free.

4. **Comparison: Site-Built vs. Pre-Fabricated Structures**

Design Phase Comparison:

Design Fee and Contractor Selection:

The Site-Built process consists of the acquisition of an architect for design services. Standard Architectural Fees typically range from 5% to 8% of the cost of construction. A contractor is not selected to construct the approved design until it is completed and issued for bids. The contract for construction is normally awarded to the lowest bid from a qualified company.

The process for a Pre-Fabricated structure differs in that the selected Pre-Fabricated Building Manufacturer coordinates directly with the client to finalize the design prior to construction. This process eliminates the need for an architect's design services. The design fee is included as part of the fee for the overall building project; therefore, it is difficult to distinguish the exact design cost incurred. Note that the design process typically does not proceed until a contract is entered between the client and contractor for the overall value of the entire design and construction of the project.

Where the pre-fabricated design process is streamlined by entering into a contract with one entity for both design and construction, eliminating an architect from the design process also removes the competitive bidding process to select a contractor. It also forces a long-term commitment with one entity.

Design Flexibility:

Design of a traditional site-built facility is only restricted by the project budget. Plan variations, materials, equipment, finishes, and other building systems are not limited by the method of construction.

Opposingly, pre-fab structures need to be designed in a manner which allows the structure to be transported via truck from the location of fabrication to the final building destination. For this reason, prefab units are restricted to approximately 11 to 12 feet in width. Facilities beyond those parameters are possible if specifically designed to be delivered in segments to be assembled on site after delivery. Due to this circumstance, most manufacturers have predesigned select building layout variations to select from to begin the design process. Utilizing those models as a basis- materials, finishes and equipment modifications are often offered and can be developed based on client requests. By beginning the process with a predesigned building model, much of the design process is omitted. The facility becomes more standardized and less customized to its specific requirements. The repetitive manufacturing of predesigned modular structures in a controlled environment has advantages to increase efficiency and reduce costs; however, as a project design develops and becomes more unique and customized, these advantages are diminished.

Of particular interest for the City of Appleton Pavilion program is the request for an extended roof to form a rentable sheltered area. While some manufacturers offer limited shelter options, our discussions with prefab representatives indicate that combining

restroom facilities with an extended shelter area does not conform to their typical pre-assembled fabrication process. In this case, if the overall facility dimensions exceed those able to be transported on a truck, the sheltered portion of the facility is anticipated to be assembled on site.

Design Schedule:

Overall, with pre-fab structures, if the final developed design closely matches one of the manufacturer's pre-designed standardized restrooms, the design and construction timeline will be condensed. As a design becomes more customized and less standardized, the benefits of the pre-fabricated process are reduced to a timeline more resembling that of the site-built process. For a traditional site-built structure, we anticipate the schedule for design and construction documentation to span approximately four months.

Bidding Phase Comparison:

As stated previously, in the traditional on-site building process, an architect creates a detailed construction document set that is issued to qualified contractors for bidding. There is no previously arranged commitment for construction. The solicitation of competitive bids from area contractors, as opposed to a commitment to a contractor before design, diminishes the risk of potential artificially inflated costs from a guaranteed contract.

In the case of Appleton Neighborhood Parks, to achieve a common pavilion theme for several parks, the commitment to a pre-fabricated manufacturer extends beyond one project, but to future park projects as well. Conversely, with the site-built process, details and customized construction documents for each project can be utilized to obtain competitive bidding on a case by case basis.

Anticipate three to four weeks duration to implement bidding by contractors for a site-built structure. Whereas the bidding process, and thus the bidding time period, is omitted for a standardized pre-fabricated building.

Construction Phase Comparison:

Construction Schedule:

Regarding the length of time required for construction, the pre-fab process has two noteworthy benefits:

- Most pre-fab manufacturers assemble structures within a controlled warehouse environment; therefore, the construction progress is not as contingent on weather conditions. After fabrication, risks exist for time delays due to weather and traffic conditions while the structure is in transit. Those risks take place over a short duration of time as compared to the entire construction period.
- On-site construction can disrupt normal park functions and at times cause disruptions such as noise and traffic hinderances to the adjacent area.

Since pre-fab structures are assembled in an off-site warehouse, rather than on-site, the time required for on-site disruptions is minimized.

- Quality Control:

1. Architect's Role: The pre-fab process is more streamlined due to the direct relationship between the client and the manufacturer for the design and fabrication of the facility, thereby eliminating an architect from the process. By eliminating one of the entities of the traditional site-built process, a seemingly simpler more condensed process is formulated. While reviewing the pros and cons of a condensed process, it is important to consider the value of what is being eliminated from the process- the role of the architect in the traditional site-built building process. The architect:
 - a. Creates construction documents for contractor bidding which are referenced in the construction contract. This holds the contractor accountable and ensures that construction is done to meet the standards set forth.
 - b. In the traditional site-built construction process, the contractor submits materials and equipment documents to the architect for approval prior to installation. The architect reviews the submitted documents and rejects them if they do not meet the standards set forth in the construction documents.
 - c. Periodically observes construction and conducts construction progress meetings.
 - d. Reviews contractor pay requests as construction proceeds. Observes construction and ensures pay request to be representative of the construction progress before authorizing payment.
 - e. Observes construction at project completion and ensures project to be satisfactorily completed prior to authorizing final payment.

By following the construction process indicated in American Institute of Architects contract documents for site-built construction, responsibilities including those listed above create a system of checks and balances amongst the entities involved, thus holding the contractor to a standard of accountability to promote sound construction.

If the pre-fabricated structure process is utilized, due to the absence of the architect's role and AIA contracts, past manufacturer project references should be requested and scrutinized prior to entering an agreement. The client should negotiate a contract which enables substantial contract balance retainage until after the facility is completed in full to an acceptable quality.

2. Off-Site Construction: Pre-fabricated construction has advantages and disadvantages to consider.
 - a. Fabricating within a warehouse with a controlled environment optimizes conditions conducive to quality construction, whereas site-built construction fosters potential construction challenges due to temperature variations, rain and humidity, and wind.
 - b. While operating in a warehouse offers a controlled environment which reduces construction challenges possibly encountered with on-site construction, it also eliminates the ability of the client, or architect, to observe the construction. During fabrication, the fabricators are only accountable to themselves. Conditions concealed by building finishes will not be observed by any outside party.

Again, for this reason, past manufacturer project references should be scrutinized prior to entering an agreement.

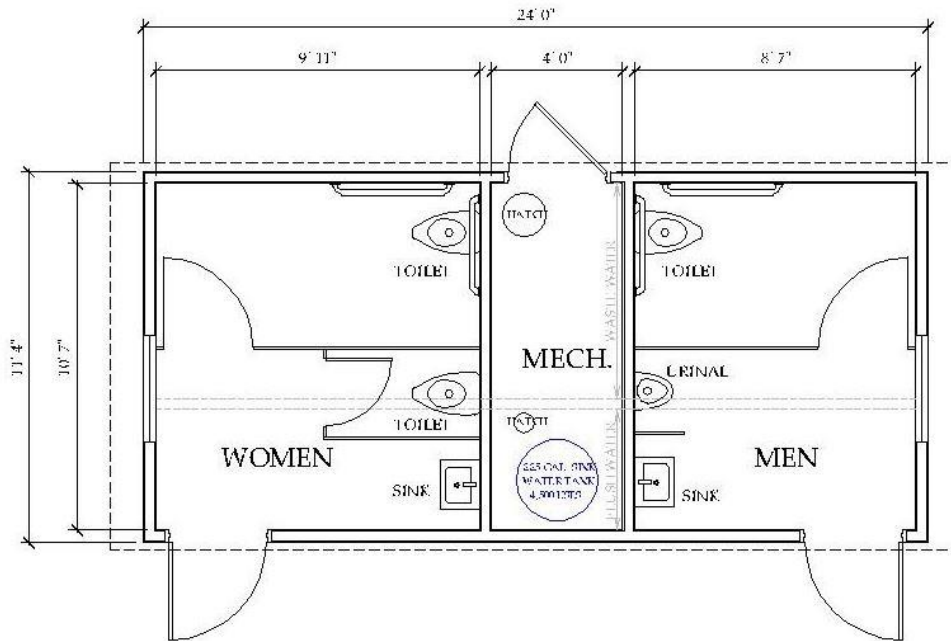
5. **Probable Construction Costs:**

To compare construction costs of a Pre-Fabricated Structure to that of a Site-Built Structure, probable costs were developed. Since durable construction is desired to reduce operation and maintenance costs, manufacturers capable of providing either precast concrete or concrete masonry unit structures were identified.

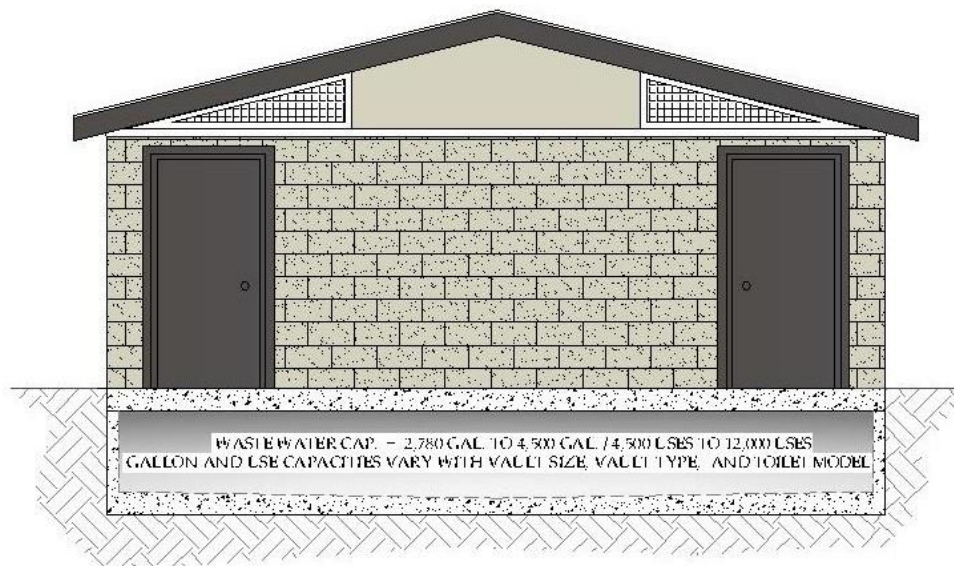
Standardized designs offered by each of the three aforementioned manufacturers were selected based on similarities to the Appleton Neighborhood Park design criteria. The manufacturer of each was then contacted to obtain a probable cost for their respective structure. Similar finish materials were requested for each to base the results on similar construction qualities.

Probable costs for each structure are provided based on similar construction and finishes; however, the facility plan layouts are not identical. To account for the difference, the probable cost for each is also presented as a cost per square foot of structure to achieve a more comparable assessment.

Pre-Fabricated Model 1:



FLOOR PLAN



EXTERIOR ELEVATION

The plan and elevation shown are representative of the “Snowmass” model offered by Green Flush Technologies. This Facility consists of concrete masonry walls with split-faced exterior finish texture along with an asphalt shingle finished roof.

*Probable Cost = \$139,900

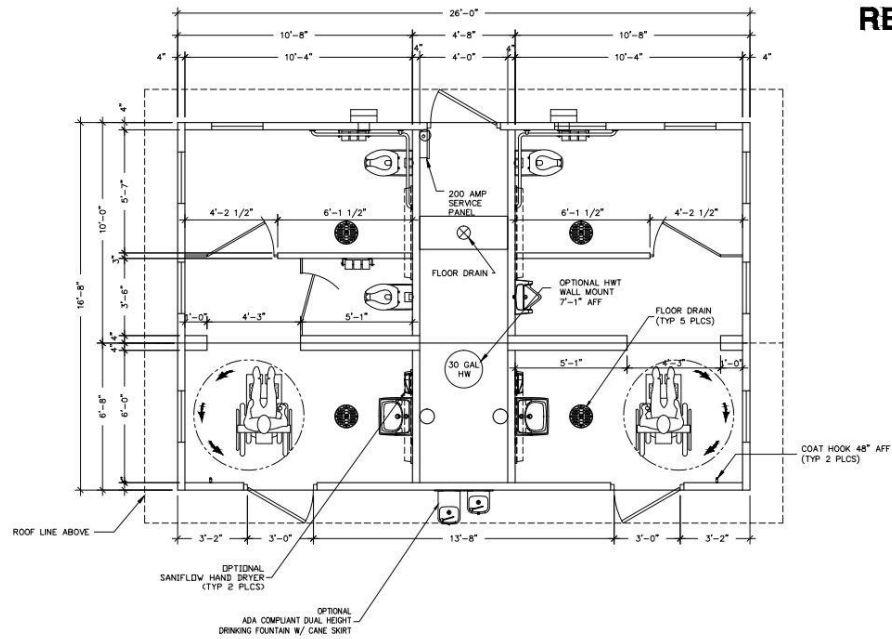
Probable Cost / Square Foot = \$514.34

*Probable Cost includes structure fabrication and delivery. Does not include installation, site work, utility connections or sales tax.

The model reflected in this Probable Cost includes:

- Concrete masonry unit walls with split-faced exterior texture
- Asphalt shingled roof
- Electric hand dryer in each restroom
- Baby-changing table in each restroom
- Window in each restroom

Pre-Fabricated Model 2:



FLOOR PLAN



EXTERIOR AXONOMETRIC RENDERING

The plan and axonometric rendering shown are representative of the “Montrose” model offered by CXT, Inc (an LB Foster Company). This Facility consists of precast concrete walls with split-faced exterior veneer finish wainscoting with horizontal lap siding above, along with a corrugated metal finished roof.

*Probable Cost = \$123,900

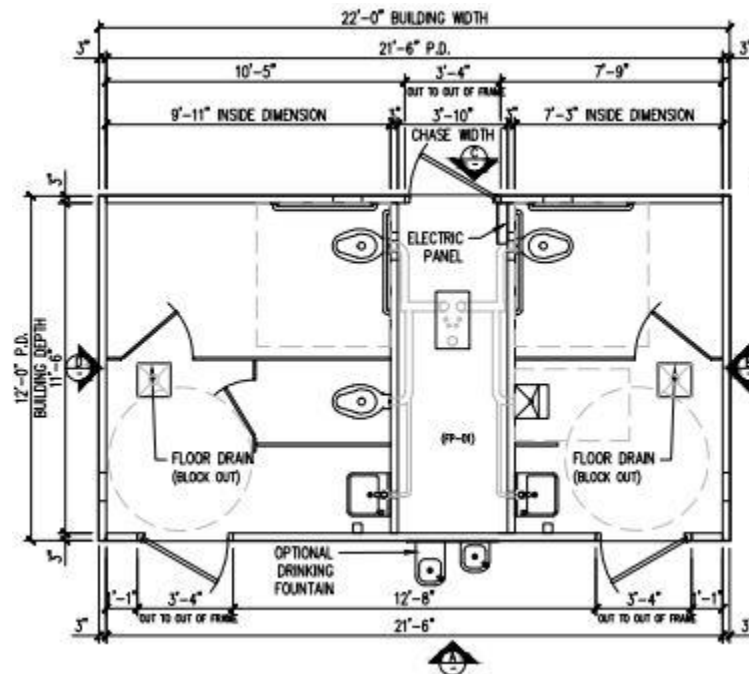
Probable Cost / Square Foot = \$284.50

*Probable Cost includes structure fabrication, delivery and installation. Site work, utility connections and sales tax not included.

The model reflected in this Probable Cost includes:

- Precast concrete exterior walls
- Split-faced concrete masonry veneer exterior wainscoting with horizontal lap siding above
- Prefinished ribbed metal roof
- Motion and photocell controlled interior lights
- Hose bib in plumbing chase area
- Five windows in each restroom
- Exhaust fan in each restroom

Pre-Fabricated Model 3:



FLOOR PLAN



EXTERIOR AXONOMETRIC RENDERING

The plan and axonometric rendering shown are representative of the "Skyline Series" model offered by Quality Precast, Inc. This Facility consists of precast concrete walls and roof. Walls include a decorative split-faced block veneer exterior.

*Probable Cost = \$80,250.00

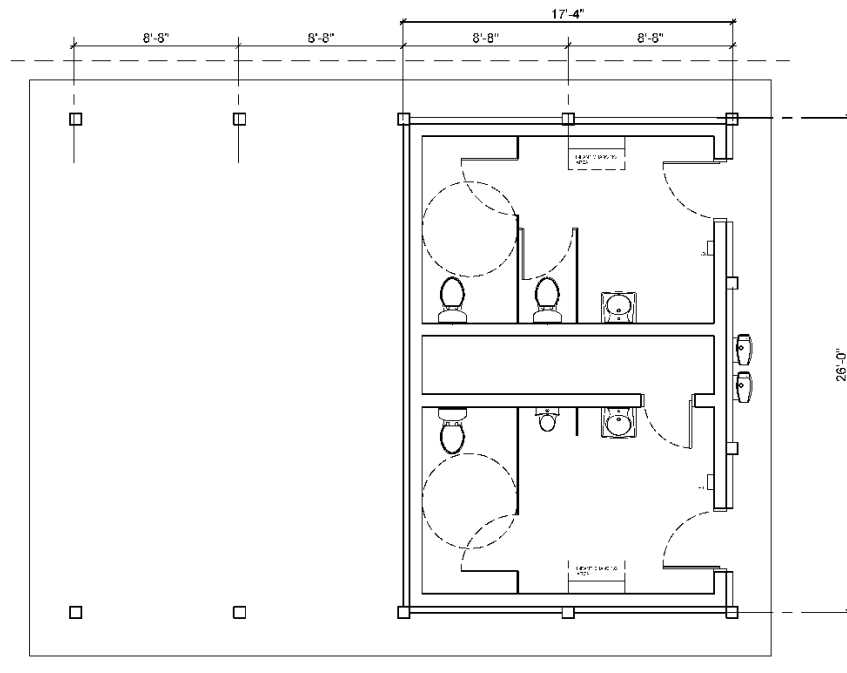
Probable Cost / Square Foot = \$303.98

*Probable Cost includes structure fabrication and delivery. Does not include installation, site work, utility connections or sales tax. This price is based on the customer having a level compacted stone base per the companies requirements.

The model reflected in this Probable Cost includes:

- Easi-Brick or Split-Face block exterior.
- interior and exterior with Graffiti Control Coated finishes.
- Electric hand dryer in each restroom
- Baby-changing table in each restroom
- Motion activated toilet flush valves in each restroom
- Electronic strikes integrated with time clock control restroom access
- window in each restroom
- Hose bib in plumbing chase area
- 1800 watt instant hot water heater
- LED wall packs on outside
- LED strip lights on interior
- Drinking Fountain

Site-Built Facility:



FLOOR PLAN



EXTERIOR ELEVATION

The Probable Construction Cost for a comparable Site-Built Facility has been developed based on a combination of costs of recently completed similar projects and by utilization of RS Means Building Construction Cost Data publications. For costs to be comparable to those indicated for the Prefabricated Restroom Facilities, the anticipated cost to run utilities to the shelter, to excavate to prepare for the facility, to connect utilities, and to provide and install the sheltered exterior area portion of the facility have been deducted from the final probable cost.

*Probable Cost = \$192,095

Probable Cost / Square Foot = \$426.88

*Probable Cost does not include site work, illustrated exterior sheltered roof area, and sales tax.

The model reflected in this Probable Cost includes:

- Concrete Masonry unit constructed walls
- Split-faced concrete masonry veneer exterior wainscoting with horizontal lap siding above
- Asphalt shingled roof
- Exterior Hose bib and outlets
- Electronic strikes integrated with time clock to control restroom access
- Motion and photocell controlled interior lights
- Epoxy finished floor with integral wall base in each restroom
- Hose Bib in each restroom
- Baby changing table in each restroom
- Electric hand dryer in each restroom
- Exhaust fan in each restroom
- Two skylights in each restroom
- Motion activated toilet flush valves and lavatory faucet operation in each restroom
- Drinking Fountain

6. Summary:

For any particular use, whether a Site-Built Facility or a Pre-Fabricated Structure is the ideal solution depends highly on the amount of unique customization desired. It is difficult to make an accurate comparison to various project type costs due to the variation within standard design options amongst the pre-fabricated structure manufacturers; regardless, the study reveals potential cost savings with Pre-Fab Construction if the design is done within the limits of standard options provided by the manufacturer. Even with the additional cost of transporting a facility to its destination, the cost savings associated with repetitive construction of standardized restrooms is apparent.

With pre-fab restroom facilities, manufacturers may offer skylights combined with integrated and controlled lights to limit energy use during daylight hours, some offer exterior drinking fountains and electric hand dryers. Whether a standard option or not, most will take extra steps to accommodate special client requests when possible- such as by providing electronically controlled and programmed locking functions on restroom access doors. As stated previously, as a design becomes customized, whether due to accommodating a specific site condition, or based on particular client requests, the benefits of the standardized construction process are diminished. In our opinion, the cost benefits will be reduced proportionally as a design becomes less standardized and more catered to specific client design needs.

If the goal is to quickly and economically upgrade park amenities with a functional restroom, a pre-fabricated restroom structure will satisfy that purpose. However, if the goal is to develop a design orientated for its site without restrictions, and with specific amenities to optimize the building's potential, a site-built facility will be more equipped to meet those needs.

The exterior sheltered area, in particular, is not an element most pre-fabricated manufacturers integrate into their facilities. The shelter, even if pre-fabricated, is required to be assembled on site. If a sheltered area is determined to be an imperative need of the Pavilion, and the sheltered area is by necessity assembled on-site, then by definition, the pre-fab process has become a site-built process. Integrating on-site assembly with pre-fabricated components minimizes the benefits of the, seemingly simpler process.