SCHEMATIC PHASE

COST ESTIMATE AND ANALYSIS

FOR THE

CITY OF MARQUETTE
PUBLIC WORKS SERVICE CENTER

Revised August 12, 1985

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CITY OF MARQUETTE

PUBLIC WORKS SERVICE CENTER

Revised August 12, 1985

The City of Marquette's proposed Public Works Service Center is to be located in the Baraga Avenue Industrial Park. The structure, approximately 88,000 square feet will house the entire City Public Works Department; engineering offices, vehicle storage area, vehicle maintenance area, cold storage, and shop areas, and also employee support areas.

The purpose of this report is to analyze the various options available and to present these options along with estimated costs for each. It is the intent of this report to present this data in such a format as to assist the City of Marquette in its analysis and decision on the most economical method of construction.

The information contained in this report is based upon projected construction costs for Spring 1987.

ZONING AND BUILDING CODES

I. Zoning Industrial District.

A. The site is zoned Industrial (I). The outside storage of vehicles and equipment is permitted in screened areas. This is the proper zoning required for this facility.

II. Set-Back and Yard Requirements.

A. Minimum front yard - 25 ft.

B. Minimum side yard - 10 ft.

C. Maximum height - 80 ft.

III Off Street Parking and Loading.

A. .1 space per 100 sq. ft. of floor area (130 spaces required). Due to the type of use involved, the Zoning Administrator must determine the actual amount of parking required for this project.

IV. Outside Stroage Areas.

A. Any outside storage or materials must be screened with a minimum 6 ft. high screening fence.

1985 BOCA BASIC NATIONAL BUILDING CODE

I. Use Group (Art .3).

A. "S-2" Low Hazard for all areas except flamable storage and office areas.

B. "B" for office areas.

II. Building Limitations (Art .5).

A. With type 2A construction there is a 34,000 sq. ft. limit, times 200% for street frontage and 200% for having a fire supression system. This means that the structure is limited to an area of 136,800 sq. ft.

III. Fire Rating of Structure (Table 401) Elements.

A.	Exterior Walls	- 2 hr.
B.	Fire Walls	- 2 hr.
C.	Exit Hallways	- 1 hr.
D.	Non-bearing Partitions	- 0 hr.
E.	Interior Bearing Walls, Columns, (Other than roofs)	
	1. Supporting floor	- 2 hr.
	2. Supporting roof	- 1 1/2 hr.
F.	Floor Construction	- 1 1/2 hr.
G.	Roof Construction	
	1. 15' to low member	- 1 hr.
	2. 15'-20' to low member	- 1 hr.
	3. 20' or more to low member	- 0 hr.

IV. Public Garage (609.0).

A. Construction S - 2.

B. Basements - place below office area to avoid limitations.

C. Oil separators required for floor drains.

D. Explosives must be stored in areas that conform to Sec. 602.0.

V. Means of Egress.

A. Exit travel.

Maximum distance to and approved exit shall be less than 300' without a fire protection system and 400 with this system.

B. Exit Lighting.

All means of egress shall be equipped with artificial emergency lighting.

SITE DRAINAGE

The proximity of Whetstone Brook allows for ease of drainage from the site, however, if the Whetstone improvements are not constructed the County Drain Commissioner may require that on-site storage will be required or improvements be made to Whetstone Brook downstream of the site (At 1982 prices these improvements from the site to Lake Superior were estimated at approximately $520,000.00). An analysis of required on-site storage has not been made but is likely to be greater than available land.

A culvert exists at the east end of the property that will be useful for drainage from the parking lot areas on the east side of the building.

The two proposed drive entrances to the west will both cross Whetstone Brook. The proposal is to provide a 7' wide by 6' high box culvert for bridging the stream at both locations. This size will meet the requirements of the proposed drainage improvements for Whetstone Brook.

UTILITIES

I. Water Supply.

A. The facility would be served off the 12" watermain in Baraga Avenue. This main runs from Ridge Street just west of McClellan Avenue and is part of the Cox Gravity System. At the facility pressures will be above 100 psi during normal usage with a maximum static pressure of 112 psi when the Cox tank is at overflow. Presently there is an adequate quantity of water available in this district.

B. A 6" service will provide adequate capacity for fire protection and domestic usage. Approximately 170 feet will be required to run from the existing 12" watermain to the building. A 12" x 6" tapping sleeve and tapping valve and box will also be required.

II. Sanitary Sewer.

A. A 12" sanitary sewer exists in Baraga Avenue that has ample available capacity for the expected loads.

B. Two leads are proposed, one from the main building and one from the salt storage area. 120 feet of 6" from the main building and 160 feet of 8" from the salt storage area.

III. Natural Gas.

A. Michigan Power Co. indicates there is ample available capacity in the gas main that parallels US-41 and is located between Baraga Avenue and US-41.

IV. Electrical Power.

A. BLP indicates there is ample available capacity.

FUEL STORAGE AND DISPENSING

The City presently uses 18,000 gallons of regular gasoline, 20,000 gallons of unleaded gasoline and 30,000 gallons of diesel fuel per year. If the County of Marquette is also allowed to fuel their vehicles an additional 15,000 gallons per year of unleaded gasoline will be used. Marquette Alger Intermediate School District may also be allowed to fuel their buses at the facility. Presently they use 20,000 gallons per year of regular gasoline but are expecting to switch to diesel in the future.

Based on full utilization 10,000 gallon tanks should be sufficient for both regular and unleaded gasoline with 9,000 gallon load delivered on the average of once every 3 months. Diesel fuel will be stored in a 20,000 gallon tank with 2,000 - 9,000 gallon loads delivered every 5 months.

The fueling station is proposed to be located on the south side of the main garage area and will consist of two islands each provided with two diesel pumps, one regular and one unleaded gas pump.

Access to the fill station will be via the two center entrances from Baraga Avenue. This location will keep travel distance on site for refueling vehicles to a minimum and help keep these vehicles from interfering with normal facility operations.

The storage tanks can be conveniently located between the two entrances and adjacent to the pavement. Code requires these tanks to be a minimum of 10 feet from the property line which can be easily accomplished in this area.

See Mechanical Section for fuel meeting devices.

AGGREGATE AND BITUMINOUS STORAGE

The City presently stores 15,000 tons of 2NS sand, 5,000 tons of 22A gravel and smaller quantities of Class II sand, pea gravel, rip rap (large and small) and various bituminous mixes.

The area provided allows easy maintenance of pile integrity by providing for separate bins and an asphalt surface for material removal. A retaining wall is provided that will contain the material and keep it from spreading as is the case at the present facility.

An entrance is provided at the west end of the site to facilitate easy access to these storage areas during hauling operations.

SALT STORAGE AND HANDLING

The facility proposed is a 75 foot diameter by 30 foot high dome placed on owner supplied base of asphalt or concrete.

It is assumed that the existing calcium chloride liquid tank and dispenser will be relocated to the new facility.

A mix and pile area is located between the salt storage and 2NS sand storage area to facilitate mixing and storing of the two materials with a minimum of endloader operation.

Drainage for salt storage areas and areas where salt sand is mixed and stored is required to be drained to the sanitary sewer system.

WETLANDS

Minor cattail areas exist in the vicinity of two of the drains, however, the DNR will more than likely not classify this as a wetland due to its limited area and the minimal impact from filling.

SOIL EROSION

Because the City is its' own Local Enforcing Agency a permit will not be required, however, a plan should be developed and implemented with a copy forwarded to the County for informational purposes.

BUILDING STRUCTURAL SYSTEMS

I. Design Criteria.

A. All structural design will be in accordance with the 1984 BOCA (Building Officials and Code Administrators International Inc.) Basic Building Code. This will be supplemented by the Michigan Administrative Code, Michigan Department of Labor, Bureau of Construction Codes.

II. Masonry Non-Load Bearing Wall - Steel Frame.

A. Substructure.

1. The building will be founded on spread footings. The perimeter of the building will be on a grade wall. All exterior footings and grade walls will extend below the frost line. The interior footings will be placed independent of the grade slab. It is anticipated some footings will be placed on structural fill material. The structural backfill will be a select compacted granular material. The interior grade slabs will be placed on a compacted granular fill. All substructure concrete will be reinforced cast-in-place concrete.

B. Superstructure.

1. The framing system utilized will be a steel deck, over steel joist bearing on parallel chord steel trusses carried by wide flanged columns. The secondary framing (steel joist) will range in spans from 20 ft. to 30 ft., and will be spaced at 5 ft $\pm$ on center. The primary framing (steel trusses) will range in span from 50 ft. to 110 ft. The roof system will be cambered or slightly pitched to provide for drainage.

2. The bracing system will have lower chord bracing with sway frames to provide lateral stability and brace points for the truss stystem. The lower chord cross bracing will be carried to the exterior walls where vertical planes of bracing will carry the lateral loads to the foundation. The planes of bracing will be placed in accordance with the expansion system for the structure.

3. The bridge-crane supporting girders will be framed

to the building columns. The girders will be fabricated from rolled shapes and will be designed as simple span. The longitudinal, lateral and vertical loads will be taken by the building structural systems.

4. During design development the structural system will be reviewed to possibly utilize the masonry walls as load bearing walls. Specifically in areas where the masonry is capable of carrying the reaction from the joist or truss.

III. Precast Tilt-Up Flat Wall Panels.

A. Substructure.

1. The precast flat wall panels can be utilized as load bearing walls, in areas where the truss or joist reaction does not exceed the capacity of the wall panel. In these areas the building will be founded on strip footings and grade walls. In the other areas the wall panels will serve as the exterior sheeting and the loads will be carried by the grade beams or grade walls as described in Part II Substructure. The interior footings and grade slab will be as described in Part II Substructure.

B. Superstructure.

1. The framing system utilized will be similiar to Part II Superstructure, with the exception being the areas where the wall panel will be utilized as a load bearing wall. In these areas the trusses and joists will frame directly onto the panel. The stability will be provided by horizontal planes of bracing at the top or bottom chords. These lateral loads will be taken in shear by the exterior wall panels to the foundation.

IV. Precast Double Tee Load Bearing Walls.

A. Substructure.

1. The double tee provides an excellent load bearing wall when the tees are on the exterior. The reason is the prestressed strands in the tip of the double tee are in the ideal location to resist the gravity loads from the truss or joist. The physical arrangement of the tee provides the stiffness desired in a structural component. The concrete strength is utilized by the final

compressive stresses being distributed throughout the component.

2. With the above in mind we would use the double tees throughout the structure as load bearing walls. Therefore, all the exterior walls would be strip footings. The double tee wall panels would bear directly on the footing. The interior footings and grade slab would be as described in Part II.

B. Superstructure.

1. The double tee at the exterior walls will serve as the load bearing wall. The roof framing system will be as described in Part II Superstructure. The stability will be provided by horizontal planes of bracing at the top or bottom chords. These lateral loads will be taken in shear by the exterior wall panels to the foundations.

V. Metal Wall Panels - Steel Frame.

A. Substructure.

1. The metal wall panels will be the lightest wall system considered. The substructure will be grade beams between spread footings. The interior footings and grade slab will be as described in Part II Substructure. The perimeter of the building could have a masonry or cast-in-place snow wall to protect the metal sheeting.

B. Superstructure.

1. The metal panel wall system will require metal girt system to span between columns. Also the expandable end wall will require wind columns to frame the girts. The girts will be cold rolled metal shapes identical to those used in metal building manufacture. The steel framing system will be the same as described in Part II Superstructure.

VI. Other Design Considerations.

A. The use of metal building components and metal building manufacturers, will be considered as a means of providing a cost effective structure. The custom nature of the facility and the use of precast

components and other features may dictate the design of the superstructure remain with the consultant.

Other factors such as life of the structure, durability, and future remodeling must be decided by the owner. Should the metal panel wall, the standing seam roof and other metal building components be selected as the architectural features desired for the facility, the most cost effective way to provide the package may be by design-build contract from a metal building supplier.

CONSTRUCTION SYSTEM ANALYSIS

I. Options.

Five different construction systems have been analyzed as options for use on this project. These systems are listed as follows:

A. Masonry Wall - Steel skeleton

B. Pre-Cast Concrete - Flat panel over steel skeleton

C. Pre-Cast Concrete - Double tee, steel roof skeleton

D. Steel Skin over steel skeleton - Component

E. Steel Skin over steel skeleton - Pre-engineered metal building

These are not the only options available, and variations or combinations of these systems are possibilities which have not been addressed at this time.

II. Fixed Areas.

Common To all five options investigated are the following assumed selections:

A. Office/Engineering area will be 3 5/8" steel studs covered with 5/8" firecode drywall and vinyl wall covering. Partition walls will be insulated against sound transmission. Ceiling will be 5/8" accoustical ceiling tile on a suspended grid system. Ceiling will be insulated with 6" fiberglass batts. Floors will be a combination of vinyl tile and carpeting. Doors will be solid core wood in wood frames with standard hardware.

B. Remaining interior walls will be 8" masonry block, unfinished.

C. Interior service doors will be 36" x 84" steel in steel frames with standard hardware.

D. Main entrance doors and all windows will be aluminum frames with insulated glazing and standard hardware.

E. Overhead garage doors will be steel insulated units with electrically powered operations.

F. Remaining floors will be reinforced concrete.

G. Perimeter and column footings will be cast in place reinforced concrete.

H. A portion of the building - approximately 3,000 sq. ft. will have a basement underneath.

I. Two mezzanine storage areas contain approximately 10,000 sq.ft. of storage space.

J. Ballasted Synthetic Rubber Membrane Roof. The ballasted membrane was selected over two other options;

1. Standing seam steel.
2. Built up asphalt.

Reasons for this are as follows:

Standing seam steel roofing may produce problems due to the extreme expansion/contraction action on a roof of this size.

Built up asphalt tends to become brittle and crack during exterme temperature differences. Synthetic rubber membrane retains its flexibility during the extreme temperatures, expands and contracts with building movement, yet maintaining weatherization.

III. Cost Estimates.

Cost estimates for each option are listed at the end of each Section and are broken down into these areas:

Total Cost for Option
Total Cost per square foot for Option
Cost per sq.ft. per area for Option

Area 1.	Office/Engineering	4,245 sq. ft.
Area 2.	Warehouse/Parts/Shop/Lunchroom	17,272 sq. ft.
Area 3.	Vehicle Service Area	20,340 sq. ft.
Area 4.	Vehicle Storage Area	46,639 sq. ft.
Area 5.	Cold Storage Area	5,280 sq. ft.
Total		93,776 sq. ft.

The mechanical and electrical systems are described in another section of this report, with their respective cost estimates.

A. Option 1. Masonry Wall-Steel Skeleton.

Description:

Exterior walls will be double eight inch masonry units with 2" urethane insulation between. Exterior block cores will be filled with vermiculite for higher insulation values. Exterior block will be single scored for aesthetic purposes. The block walls will be constructed around structural steel columns.

The roof support system consists of the vertical columns, spaced at 26' center to center, steel trusses spaced 26' center to center, steel roof joists spaced on 5' centers, corrugated steel decking, 4" Urethane insulation and ballasted membrane roofing.

Total Cost - Option #1: $ 2,261,175.00

Total Area = 88,500 square feet

Cost/Sq.Foot : $25.55

Cost/Sq.Foot per Area :

1.	Office/Engineering	$ 108,459.00
2.	Warehouse/Parts/Shop	$ 441,299.00
3.	Vehicle Service Area	$ 519,687.00
4.	Vehicle Storage Area	$ 1,191,626.00
5.	Cold Storage Area	$ 134,904.00

B. Option 2 - Pre Cast Tilt up flat panels - Steel Roof.

This system incorporates the use of flat pre-cast wall panels which are set onto a keyed concrete footing. The roof system and interior steel support columns would be identical to that of the Masonry/Steel option. Again, the interior partition walls will be masonry block and the office area will be steel stud, drywall, vinyl wall covering and suspended ceiling.

Exterior service doors, interior doors, overhead door and windows are identical to Option 1.

Total Cost - Option 2 $1,916,910.00

Total Area - 88,500 Square feet

Cost /Square foot $21.66

Cost /Square foot per Area.

Office/Engineering	$ 91,949.00
Warehouse/Parts/Shop	$ 374,111.00
Vehicle Service Area	$ 440,564.00
Vehicle Storage Area	$1,010,200.00
Cold Storage Area	$ 114,364.00

C. Option 3 - Pre-cast Double Tee Load Bearing Wall - Steel Roof.

In this system, we take advantage of a load bearing, double tee precast concrete panel to carry the roof load to the footings. This system eliminates the vertical exterior steel columns and column footings. The interior system and roof steel support and membrane are identical to those in Option 1 and Option 2.

Total cost Option 3: $ 1,910,715.00

Total Area - 88,500 Square feet

Cost per square foot: $21.59

Cost per square foot per area

1.	Office/Engineering	$ 91,649.00
2.	Warehouse/Parts/Shop	$ 372,902.00
3.	Vehicle Service Area	$ 439,140.00
4.	Vehicle Storage Area	$ 1,006,936.00
5.	Cold Storage Area	$ 113,995.00

D. Option 4 - Steel Skin over Steel Skeleton - Component Supplier.

Option 4 incorporates a structural steel frame very similar to the frame in Option 1 - Masonry-Steel Skeleton, with the following exception. In addition to the Vertical exterior columns, steel "C" shaped girts are attached to the exterior of the vertical columns, spaced horizontally on 5' centers. Foil faced fiberglass wall insulation and 26 gauge ribbed steel sheeting are attached to the girts to complete the exterior wall. The roof structural and sheeting systems are complete and identical to those used in previous options. Interior surfaces of exterior walls will be lined with 26 gauge ribbed sheet steel.

Total Cost Option 4: $ 1,958,505.00

Total Area - 88,500 Square feet

Cost per square foot: $22.13

Cost per square foot per area:

1.	Office Engineering	$ 93,941.00
2.	Warehouse/Parts/Shop	$ 382,229.00
3.	Vehicle Service Area	$ 450,124.00
4.	Vehicle Storage Area	$ 1,032,121.00
5.	Cold Storage Area	$ 116,846.00

E. Option 5 - Steel Skin - Steel Skeleton - Single Source Supplier.

This the final system analyzed, is identical in all phases to option 4, and could be named "Pre-engineered metal Building".

This type of building is purchased from a steel building manufacturer. The customer, through his engineer, furnishes to the manufacturer certain design criteria which the manufacturer uses as a guideline in engineering the building. The cost for this type of building varies from that in Option #4, due to reduced engineering fees, proven established design criteria for acceptable loading and other design requirements, and volume purchasing by the manufacturer.

Total Cost Option 5: $1,321,305.00

Total Area - 88,500 Square feet

Cost per square foot: $14.93

Cost per square foot per area

1.	Office/Engineering	$ 63,377.00
2.	Warehouse/Parts/Shop	257,870.00
3.	Vehicle Service Area	303,676.00
4.	Vehicle Storage Area	696,320.00
5.	Cold Storage Area	78,830.00

SUMMARY
FOR
SCHEMATIC PHASE ANALYSIS
OF
HEATING, VENTILATING AND AIR CONDITIONING

Numerous systems for heating, ventilating and air conditioning were studied for this facility and are outlined herein. The building was broken up into several areas based on the ventilation requirements, the heating requirements and the total air conditioning requirements of each area. Many of these systems for the various areas will need further study into the design development stage. Systems were analyzed on the basis of total life cycle costs. In general systems offering the most flexibility and the lowest total operating cost have been recommended in this phase summary. In many of the larger areas the ventilation requirements for those areas outweigh the actual space comfort heating load.

Due to the large heating loads and ventilating heat requirements this facility offers great potential for the use of alternate fuels in lieu of gas. Analysis which were made of the heat generation equipment at this time indicates that a wood fuel pellet/gas combination system would provide the most flexible and cost effective heat generating system. Other systems throughout the building have been analyzed on a basis of being provided with steam or hot water for thermal energy rather than gas. Infrared systems were looked at for a number of the areas. It is recommended at this time in view of the potential for the use of alternate fuels for heat generation that systems using hot water or steam be considered instead of systems being directly fired with natural gas. The Outline on the following page, summarizes the type of systems for the various areas studied. The information provides a more detailed description of the systems looked at.

Heat recovery systems which were investigated for the large vehicle storage area do not offer an economical heat recovery option due to the low temperature which will be maintained in that area. Other areas in the building such as the main garage area and other service departments offer reasonably economical opportunities for heat recovery. However, due to space limitations in those areas further study of these systems is being undertaken and should continue into the design development phase. A system for incinerating waste oil and using that energy to preheat water or make-up air has been investigated. However, due to the low volume (700 gallons) of waste oil presently being generated per year the addition of this type of system does not present an economical solution for waste oil heat recovery.

It seems prudent, at this point to summarize the estimated construction costs as a range of construction costs until design development phase studies have been completed. The estimated construction cost range at this time for the heating, ventilating and air conditioning systems is $690,000.00 to $796,000.00.

HVAC SCHEMATIC SYSTEM SELECTION RECOMMENDATION

DESIGNATED AREA	AREA DESCRIPTION	SPACE DESIGN CONDITIONS	HEATING	VENTILATING	AIR CONDITIONING	REMARKS	TOTAL SCHEMATIC ESTIMATED COST
A	CARGO & MISC. STORAGE	AMBIENT	NONE	ROOF VENTILATORS AND FAN W/MANUAL SWITCH	NONE		$ 3,000
B	VEHICLE WAREHOUSE	45°F -25°F	HYDRONIC OR STEAM UNIT HEATERS	CEILING MOUNTED CENTRIFUGAL FANS W/PREHEAT COIL	NONE	CO EXHAUST DUCTS	$135,000
C	WASH AND LUBE AREA	50°F TO 60°F	HYDRONIC RADIANT FLOOR	GENERAL VENTILATION	NONE		$ 19,000
D	SHOP AREA, PARTS WAREHOUSE	DAY 65°F NIGHT 55°F	HYDRONIC RADIANT FLOOR AND UNIT HEATERS	CENTRIFUGAL H & V UNIT	NONE	CARPENTRY EXHAUST LOCAL WELDING HOODS	$ 27,000
E	MAIN VEHICLE REPAIR AREA	DAY 65°F NIGHT 55°F	HYDRONIC RADIANT FLOOR	FLOOR INLET AND OVERHEAD EXHAUST REMOVAL SYSTEMS, GENERAL VENTILATION	NONE		$ 60,000
F	PAINTING/WELDING AREA	DAY 65°F NIGHT 55°F	HYDRONIC RADIANT FLOOR	SYSTEM OF HOODS AND FANS - PAINT SPRAY BOTH SUPPLY AND EXHAUST	NONE	PAINT STORAGE	$ 44,000
G	LUNCH AND LOCKER ROOMS	OCCUPIED 70°F UNOCCUPIED 55°F	HYDRONIC RADIANT FLOOR	LOCKER ROOM CENTRIFUGAL ROOF FAN	WITH VENTILATION	TOILET ROOMS AND JANITORS CLOSETS EXHAUST	$ 17,000
H	OFFICE AREA	SUMMER 75°F WINTER 70°F UNOCCUPIED 55°F	HYDRONIC PREHEAT AND BASE-BOARD	ROOFTOP VAV FORCED AIR	WITH VENTILATION		$ 50,000
I	DOMESTIC HOT WATER AND	HOT SERVICE WATER	HEATING				$ 17,000
J	HEAT GENERATING EQUIPMENT (BIOMASS FUEL		WITH GAS BACKUP SYSTEM)				$ 215,000 $ 570,000

PROPOSED HEAT GENERATION

I. Heating Systems.

For this facility, there are a number of areas each with different heating load requirements, and a number of different potentially applicable systems. The various areas considered are as follows:

A. Cargo and misc. equipment; cold storage

B. Vehicle warehouse

C. Wash and lube areas

D. Shop areas, south and warehouse/parts

E. Main vehicle repair area

F. Painting shop and welding shop areas

G. Foreman, lunchroom, and locker room area

H. Office area

I. Domestic hot water and hot service water, heating

J. Heat generating equipment and systems

The following paragraphs outline the estimated load requirements for each area, the potential system options available for each area, the recommended option and probable preliminary construction cost estimate.

A. Cargo and Misc. Equipment; Cold Storage.

Design Criteria:

Temperature: Ambient
Ventilation: Timer and mechanical ventilation if heated, natural roof vents if not heated.

1. No heat required.

2. Ventilation maybe required, depending on what is stored in these areas.

B. Vehicle Warehousing.

Temperature: 45 degrees F
Ventilation: Yes, mechanical w/timer or gas monitor

1. Options available:

   a. Gas fired infra red, continuous tube or unit heater.

   b. Gas forced air, fixed as part of multi-unit CO ventilation system, multi-unit single zone systems.

   c. Steam or hot water, forced air system with a number of single zone systems.

   d. Hydronic (hot water) floor panel heating with in floor panel. All in conjunction with door heaters and ceiling heat fans.

2. Construction cost estimate - schematic phase for this area, heating system first costs are estimated to be in the range of $50,500 to $101,000. Due to the large number of interacting variables between ventilation and heating, these systems, their life cycle costs, their cost effect on the rest of the facility, and their annual operating costs will be evaluated in the design development phase.

C. Wash and Lube Area.

Design Temperature : 50 - 60 degrees F
Ventilation Required: Yes

1. Options available:

   a. Gas fired infrared

   b. Hydronic floor panel system

   c. Steam or hot water unit heaters

2. Relative Construction Cost - Initially, the ideal for this area would be the floor panel heating. The cost for the system for this area would be in the range of $10,000 - $14,100, including ventilating and air curtains.

D. Shop areas, south and warehouse*/parts area.

Temperature : Day - 65 degrees
Nite - 55 degrees
Ventilation : Yes

* Ambient temp. outdoors

1. Options available:

   a. Gas forced air - air handler or unit heater.

   b. Steam or hot water coils in air handler, or unit heaters.

   c. Hydronic (hot water) floor panel system.

   d. Hydronic baseboard or wall fintube system.

2. Relative Construction Cost: Based on knowns at this time, it appears the most cost effective system(s) for this area would be a hydronic panel system. Estimated cost for heating in this area is in the range of $21,500 to $25,000.00.

E. Main Vehicle Repair Area.

Temperature : Day - 65 degrees
Nite - 55 degrees
Ventilation : Yes

1. Options available:

   a. Gas fired infrared, unit or continuous tube

   b. Gas forced air

c. Hot water or steam, forced air or unit heaters

d. Hydronic floor panel system

2. Relative construction cost: Based on currently known factors, the hydronic floor panel system offers the most flexible system along with several advantages. Estimated construction cost for this location is in the range of $30,000 to $44,000.

F. Painting/Welding Area.

1. Options available:

a. Gas forced air rooftop in conjunction w/vent.

b. Steam or hot water coils in air handlers

c. Hydronic floor panels

2. Relative Construction Cost: Considering this area as one similiar area, initially the hydronic floor panel system appears to offer flexibility and competitive costs. The system used will have to work well in conjunction with the ventilating systems in the paint spray areas, sand blast and welding area. Estimated construction cost for the heating for this area is $18,000 to $30,000.

G. Foreman, Lunch and Locker Room.

1. Options available:

a. Gas fired forced air

b. Hot water or steam forced air

c. Hydronic baseboard or wall fin

d. Hydronic floor panel system

2. Relative construction Costs: The ideal system for this area would be a hydronic floor panel system, with three zones. The most cost effective would be a combination of hydronic floor panel and wall fin or cabinet heaters. Estimated construction cost for these locations is in the range of $10,000 to $14,500.

H. Office Area.

1. Options available:

a. Gas fired forced air, rooftop, VAV

b. Gas fired forced air, single zone package in combination with perimeter hydronic baseboard.

c. Steam or hot water, forced air with hydronic zone coils.

d. Gas fired, forced air VAV with perimeter hydronic baseboard.

e. Steam or hot water, forced in, VAV with perimeter hydronic baseboard.

2. Relative Construction cost: The most comfortable, most flexible system is - e., above. The least costly is - a., above. The variations are numerous, and further study is required into the design development stage. The estimated construction cost is in the range of $15,000 to $28,000.

I. Domestic and Service Hot Water.

1. Options available:

a. Central gas fired demand and storage heater with point of use heaters for remote lavatories, and washing equipment.

b. Central steam to water semi-instantaneous heater or water to water heater with storage, in conjunction with point of use heaters described in - a., above for vehicle washing equipment and remote lavatories and service sinks.

c. Electric water heaters throughout, for all heaters.

d. Combination of any of the above with a solar preheat system.

2. Relative Construction Cost: The cost of the domestic water systems is dependent upon the type of energy used to generate heat and the distance it is piped. These systems will require further study into the design development stage. The estimated construction cost for the domestic and service hot water heating system is in the range of $11,000.00 to $17,500.00. The addition of a solar preheat system for this system

would be in the range of $6,600.00 to $11,200.00, depending on which size preheat has the best life cycle costs.

J. Heat Generating Equipment and Systems.

1. Options available:

   a. Gas fired, forced air equipment throughout

   b. Gas fired steam boilers with hot water convertors

   c. Combination gas/heavy oil steam boilers with convertors

   d. Combination gas/heavy oil water boilers

   e. Combination gas/wood pellet boilers, steam with convertors

2. Additional Considerations

   a. Waste oil incineration with heat recovery boilers

   b. Municipal solid waste recovery boiler system

   c. Municipal solid waste heat recovery with fuel enhanced by addition of biomass fuel pellets and gas ignition.

3. Relative construction cost comparison: In any combination of the above systems, consideration must be given to:

   a. Load requirements i.e., type, size, and fluctuations.

   b. Seasonal load variations

   c. Fuel availability

   d. Fuel cost

   e. Extent of distribution system and loads served

   f. Life cycle owning and operating costs of the equipment

   g. Life of the system

   Considering only the public works facility and intended loads, it appears at this stage that a combination wood pellet fired/gas fired steam boiler to convertor system would be the most cost effective

solution to provide thermal energy. Further study of these options will be on going into the design development stages. These estimated construction cost for this system with 3 separate boilers, each capable of 150 boiler horsepower, would be in the range of $180,000 to $235,000.00, including pellet storage and handling systems, and combination gas/fuel pellet burner.

VENTILATION SYSTEMS

I. Vehicle Storage and Repair Areas.

The supply and exhaust systems within these areas of the facility will be dependent on, and part of, the CO ventilation system.

Normally the ventilation system of a vehicular facility requires large air volumes working against relatively low pressures. Under these conditions some fan designs have low efficiencies, thus the choice of suitable fan type is often limited to either centrifugal or vaneaxial. The number and size of fans should be selected to build sufficient flexibility into the system to meet the varying air demands created by daily and seasonal traffic fluctuations.

Supply louvers with sufficiently low enough face velocities to be weatherproof may not be possible in certain ventilation systems due to the huge quantities of intake air required. Therefore, intake plenums shafts, and fan housings should be provided with water drains. Exhaust stack discharge velocity should be near 2,000 FPM to facilitate dispersion of contaminants into the atmosphere. Avoid all possibilities of moisture coming in contact with the inside of exhaust ducts. Water will dissolve vehicle exhaust material deposited on the inner surface of the stack and become extremely corrosive. Exhaust fan housings should be fabricated of a corrosion resistant material or be coated to protect the metal from corrosion. Minimum ventilation requirements during occupied periods is 1.5 CFM/sq. ft. In such areas as vehicle storage, repair areas and maintenance shops sixty seven percent of the required ventilation air specified may be recirculated if the concentration of particulates is less than that specified in Table M-1010.1, BOCA Code. Eighty-five percent recirculation will be allowed if the system is also equipped with effective absorption or filtering equipment so that the condition of the air remains within the quality limits of Table M-1020.1.

A. Vaneaxial supply and exhaust fans.

1. Should include duct coil or heater to temper supply air. Controls can be on CO sensor monitor at 50, 100 and 150 ppm to stage fans.

2. Cost: $ 88,000.00

3. Code Ref: BOCA M-1008.2; M-1010.2.

B. Rooftop ventilation.

1. Includes fans and auxilliary heat. Controls can be on CO sensor to stage units on or on time clock.

2. Cost: $ 95,000.00

II. Toilet Room and Janitors Closet exhaust.

A. A roof mounted centrifugal exhaust fan shall run continuously during occupied times to provide required ventilation of 40 CFM per water closet or urinal. Make-up air provided from adjoining space.

B. Cost: $2,100.00

C. Code Ref: BOCA - 711.0

III. Locker Rooms.

A. A roof mounted centrifugal exhaust fan shall run continuously during occupied times to provide required ventilation of 2 CFM per square foot or 30 CFM per locker, which ever is less. Make-up air will be provided by both exhausting it from the adjoining space and supplying air to the locker rooms.

B. Cost: $1,400.00

IV. Maintenance Shops.

A. HVAC equipment shall be provided in the maintenance shops to provide 10 CFM of ventilation air per human occupant.

B. Cost: $5,000.00

C. Code Ref: BOCA - 614.0

SPECIAL VENTILATION REQUIREMENTS

I. Paint Spray Booths.

A. The minimum cross sectional velocity of ventilation air measured across direction of air flow for spray painting rooms or booths shall be 100 FPM @ face of spray booth. Any openings, other than the air supply opening, shall be electrically interlocked so as to prevent operating of spray equipment until such openings are closed. The compressed air supply to spray painting equipment shall be interlocked with the ventilation and make-up air equipment to assure the operation of such equipment during spraying operations. The air inlet opening shall be located so as to provide a uniform sweep of air throughout the entire room toward the exhaust opening(s). Spraying operations shall be across or with the air stream. Fans located outside the booth do not require explosion proof motors and nonferrous fan blades.

B. Cost: $26,000.00

C. Code Ref: BOCA - 611.0; M-1004.3

II. Small Engine Repair.

A. This shall include any area inside a building where fuel is used. The ventilation system shall be independent of all other ventilating, cooling or heating systems. Vapors shall be removed through a system of ducts. Inlets shall be located to produce a sweeping or purging effect that will avoid pockets in which vapors may accumulate. Exhaust opening shall be located at the floor line.

Localized exhaust hoods could also be utilized in this area.

B. Cost: $4,500.00

C. Code Ref: BOCA - 616.0, 614.0, M-10008.2.3 NFPA 70

CONTAMINANT VENTING SYSTEM

I. Floor inlet exhaust removal system.

The most effective means of reducing contaminated air in large spaces is by means of dilution. Supply fans should be used to reduce the parts per million (ppm) of contaminated air by bringing in clean outside air. Trying to reduce contaminants by relying only on exhausting air from a space may only create pockets of clean air while other areas exceed safe limits of contamination.

A. Recessed tube type floor inlets with covers used with a tailpipe adapter for removal of exhaust directly from the vehicle. Can be used for automobiles, trucks, buses, diesels and gas motors. System is concealed below floor and out of way of workers, crane, etc. Will be provided in 6 bays.

1. Repair and maintenance areas

B. Cost: $6,430.00

C. Code Ref: ASHRAE Systems 2.3

II. Overhead exhaust removal system.

A. Comprised of overhead suspended ductwork and flexible tubing with tailpipe adapters. Requires pulley and rope to raise or lower suspended tailpipe adapter. Should be provided in 4 bays for stack exhaust vehicles.

1. Repair and maintenance areas.

B. Cost: $4,800.00

C. Code Ref: ASHRAE System 2.3

III. Fan power CO exhaust. (Option).

A. Exhaust fans mounted on the roof or sidewall are ducted down to within 18" of the floor. CO monitors cycle the fan thru 3 speeds to control the CO concentration.

1. Repair and maintenance.

2. Vehicle storage

B. Cost: $45,000.00

IV. Pressurized exhaust.

A. Requires a forced air heating system to pressurize the building and force a determined amount of exhaust thru ducts located 18" above the floor and open to the outside near the ceiling. Backdraft dampers are required in the duct discharge opening.

1. Repair and maintenance.

2. Vehicle storage.

B. Cost: $18,000.00

HEAT RECOVERY SYSTEMS

Heat recovery is used within a building to achieve a "balanced system", or one in which all energy producing and HVAC systems work together year round to use all the internal heat before any external heat is added. External heat is the heat from sources outside the system, i.e., gas, oil, electricity and solar. All energy producing systems have a potential for recovery, however only some may be cost effective. Life cycle costing should be looked at before any of the following systems are selected. Inital costs are directly dependent on equipment size, HVAC system types, location of equipment and recovery systems selected.

I. The use of exhaust air for tempering makeup air.

   A. Exhaust air may include CO exhaust, air from toilet rooms and showers and ventilation exhaust from battery storage, fuel area and local exhaust.

II. The use of exhaust air for tempering domestic and service water.

   A. Exhaust air includes those sources listed above to preheat vehicle wash water or domestic hot water.

III. Water to water heat recovery.

   A. The use of vehicle wash water to preheat service or domestic water.

   B. The use of compressor cooling water for use in domestic or service water preheat.

IV. Water to air heat recovery.

   A. Compressor cooling water for use in preheating makeup air.

V. Coiling Heat Fans.

   A. Recommended for use in all areas where the ceiling height is greater than 12' high to recover stratified heat at the ceiling. Fans should be interlocked with any fire alarm systems to shut-off upon fire signal. Operation is encourage during CO contamination venting to reduce pockets of high contaminant levels.

LOCAL EXHAUST SYSTEMS

Local exhaust systems have four basic components: (1) the hood or entry point of the system, (2) the duct system to transport air and particulates, (3) the air cleaning device to remove contaminants from the air stream and (4) the air moving device.

I. Local Welding Hoods.

A. Information obtained from "Welders Handbook" Copy Write 1981. A vent should be provided when (1) space is less than 10,000 cubic feet per welder or (2) ceiling height less than 16 feet. If a general venting system is employed an air handle is required to exhaust 2,000 CFM/welder or an approved respirator may be provided. The use of a local exhaust ventilation system cuts down the total CFM's quite noticably. The system is designed with flex duct so it can be placed near to the welding being done.

DISTANCE FROM WELDER	MINIMUM AIR CFM
6"	250
9"	400
12"	1,000

Baffles and flanges help increase effectiveness.

$Q = 0.75V(5x + A)CF$

$Q = 0.75(200)[5(1) + 6]1$

$Q = \underline{1650 \text{ CFM}}$

V = Velocity
X = Distance Away
A = Cross Sec. Area
CF = Constant

B. Costs: $14,250.00

C. Code Ref: ASHRAE Systems, Welders Handbook

II. Carpentry Shop Exhaust.

A. Used to remove sawdust and wood waste from power tool stations.

B. Cost: $5,000.00

OFFICE AIR CONDITIONING

I. Low velocity VAV.

A. Ventilation and cooling is provided to each zone in only the quantity required for cooling. Allows for total fan shut-off during unoccupied periods. Requires baseboard heat.

B. Cost: $42,000.00

II. Multiple Rooftop single zone units. (Option)

A. Each zone within the building would require separate rooftop units. Allows locker rooms and different office areas to be on independent night set back times. Allows for free cooling and flexibility for future office remodeling. Requires a flat roof.

B. Cost: $6.55/sq.ft. x 5,500 sq.ft. = $36,000.00

III. Rooftop Multizone HVAC unit. (Option)

The office area shall be pressurized with respect to the remaining facility to prevent intrusion of engine fumes.

A. A single large rooftop unit provides up to eight zones of heating, ventilating and cooling. Large supply and return air ducts demand large duct provisions in ceiling space or on roof. Sophisticated controls and components has created difficult service problems. Hot gas reheat and free cooling are economical options. Required flat roof.

B. Cost: $9.50/sq.ft x 5,500 sq.ft. = $52,250.00

a. Electrical shop, computer area.

B. Cost: $1,350.00/Price reflects (30) 10# extinguishers

C. Code Ref: NFPA 10

IV. Carbon Dioxide or Halogenated Systems.

A. One of these types is recommended for the fire protection of the battery storage area. Discharge alarms and breathing apparatus shall be provided to insure prompt evacuation and prompt rescue of any trapped personnel.

B. Cost: $400.00

C. Code Ref: BOCA 1708.0, 1709.0; NFPA 12, 12A, 12B

DOMESTIC PLUMBING FIXTURES

I. Water Closets - Flush Valve Type

All plumbing fixtures include rough-in of waste, vent, water and any required carriers.

A. Bowls must be of elongated type. Seats are to be of a hinged open front type.

1. Toilet areas and Locker Room

No. Persons	No. Fixtures
1-15	1
16-35	2
36-55	3
56-80	4
81-110	5

Over 110 add 1 fixture for each 40 persons.

B. Cost: $6,000.00

C. Code Ref: BOCA P-1205.0

II. Urinals.

A. For public use urinals shall have a visible water trap seal without strainer to permit proper cleaning and maintenance. Surrounding area shall be waterproof with a smooth, readily cleanable, non-absorbent material. Urinals may not replace more than 1/3 of the required number of water closets.

1. Mens toilet areas.

2. Locker room.

B. Cost: $4,000.00

C. Code Ref: BOCA P-1206.0

III. Lavatories.

A. Lavs. shall have waste outlets not less than 1 1/4" in dia. a strainer, pop-up stopper, cross bar or other device shall be provided to restrict the clear opening of the waste outlet.

1. Toilet areas and Locker Room.

No. Person	No. Fixture
1-15	1
16-35	2
36-60	3
61-90	4
91-125	5

Over 125 add 1 fixture for ea. 45 persons.

B. Cost: $6,000.00

C. Code Ref: BOCA P-1209.0

IV. Water Coolers - 1 fixt. for ea. 75 persons (At least 1 per floor). We have included a cost for 2 coolers - one in the garage and one in the office.

A. Drains for water coolers shall be straight and as short as possible to outlet. Fountains are not to be installed in restrooms.

1. Office area.

2. Repair area.

B. Cost: $2,100.00

C. Code Ref: BOCA P-1220.0

V. Service Sinks - 3 Total.

A. Sinks shall be provided with waste outlets not less than 1 1/2" diameter, a strainer, crossbar or other device shall be provided to restrict clear opening of waste outlet.

1. Repair area.

2. Possibly lube area.

B. Cost: $3,600.00

C. Code Ref: BOCA P-1212.0

VI. Showers

Includes group showers in men's locker and single stalls in women's.

A. Every water supply riser from shower valve to head

DOMESTIC WATER DISTRIBUTION - COLD

I. City Water Distribution System.

A. Domestic water will be metered and distributed to toilet rooms, lavatories, electric water coolers, shower room and utility sinks in shop areas.

B. Cost: $12,000.00

SERVICE WATER DISTRIBUTION - COLD

I. City Water Distribution System.

A. Service water will be metered and distributed to the wash bay, janitor sinks, meter repair, etc.

B. Fire protection water, not metered, will be taken from City main just before the meter for the domestic and service water and distributed to the water sprinkler systems and standpipes.

C. Service water flow shall be controlled with back-flow prevention device(s).

D. Cost: $8,040.00

DOMESTIC WATER DISTRIBUTION - HOT

I. City Water Distribution System.

A. Hot water, from the heat generation system, will be piped to sinks, lavatories, showers, eye wash stations and wash bays.

B. Cost: $7,300.00

SAFETY SHOWERS

I. Free Standing.

A. 10" yellow shower head, 1" stay open ball valve operated by triangle pull rod, 1 1/4" galv. pipe 9" base, 1 1/4" internal pipe size, minimum press 10 psi, sign reads - Emergency Shower - List of options.

B. Cost: $300.00

II. Horizontal Supply. (Option)

A. 10" yellow shower head, 1" stay open ball valve operated by pull rod, pipe is galv., 1" internal, minimum press 10 psi, Emergency Shower sign, list of options.

B. Cost: $260.00

III. Vertical Supply. (Option)

A. Same as above mentioned (horizontal supply)

B. Cost: $260.00

OPTIONS

1. Stainless head
2. Self closing ball valve
3. Frost proof - hand operated
4. Frost proof - treadle operated
5. Air alarm horn
6. Pull chain
7. Double chain - one to open valve, one to shut valve
8. Aux. face and body spray - to flush eyes, face and hard to reach areas.

EYE WASH

I. Pedestal Mounted.

A. 10" bowl, chrome plated brass twin aerated eye wash heads, 1/2" Internal pipe size with stay open ball valve manually operated with push flange handle, stream control, waste drain dome shaped w/1 1/4" drain fitting, support - 1 1/4" galv. pipe 9" flange, sign - Emergency Eye Wash Fountain, list of options.

B. Cost: $265.00

II. Wall Mounted. (Option)

A. Same characteristics as floor mounted except heavy gage stainless steel wall bracket w/ two clearance slots for mounting bolts.

B. Cost: $280.00

III. Swing Down Eye Wash Fountain. (Option)

A. Chrome plated twin aerated eyewash heads, internal stay-open valve which is activated when heads pulled down - a 90 degree turn, water flow continues until heads are returned to upright position, vandal proof feature, cabinets are constructed of No. 18 ga., type 304 stainless steel for flush mounting into wall, 1/2" internal pipe size, Emergency Eye Wash Fountain, sign.

B. Cost: $325.00

COMBINATION DRENCH SHOWER/EYE WASH

I. Combination.

A. 10" shower head w/1" stay-open valve operated by triangle pull chain (same as free standing) 10" eyewash bowl, twin aerated eyewash heads, 1/2" stay-open valve operated by push flange, 3 GPM flow control, 1 1/4" galv. pipe w/9" floor flange, provisions for vertical or horizontal supply, sign reads - "Emergency Shower", list of options.

B. Cost: $420.00

BUILDING DRAINAGE SYSTEMS

I. Sanitary System.

A. A sewer which carries sewage and excludes storm, surface and ground water. The sanitary system shall serve all toilet rooms, water coolers, sinks, meter test area, janitors closets, mop basins and collect the treated oily waste.

B. Cost: $21,600.00

C. Code Ref: BOCA P-302, P-303

II. Storm system.

A. A sewer used for conveying rain water, surface water, condensate, cooling water or similiar liquid wastes.

1. Roof drainage
2. Site drainage
3. Condensate from cooling system

B. Cost: $95,600.00

C. Code Ref: BOCA Article 8 Plumbing

FLOOR DRAINAGE SYSTEMS

I. Pre-cast Polyester Concrete Channels.

A. Continuous trench drain for good drainage of large floor areas. Includes periodic catch basins.

1. Vehicle storage
2. Wash bays and lube bay
3. Sloping grades at vehicle entrance doors

B. Cost: $29.00/ft. x 1800' = $52,200.00

II. Cast Iron round or square top floor drains.

A. Used for drainage of small floor areas where the amount of run off is minimal.

1. Shops
2. Shower rooms
3. Toilet rooms

B. Cost: $4,730.00

C. Code Ref: BOCA P-1219.0

VEHICLE WASH

A vehicle wash requires a 1 1/2" - 2" water supply. Drainage may be a trench sloping to a 4" waste line or the floor sloping to a pit which is equipped with a sump pump and a 4" sewer service (minimum). Typical electrical requirements are 460 volt, 3 phase, 60 Hz, 30 amps.

I. Automatic Drive Thru Systems.

A. One system is capable of washing vehicles from cars to large trucks (max. 12' high). If vehicle is in excess of 12' two systems will be required. System consists of (1) Guide rails; (2) Pre rinse and soaper arch; (3) Degreaser arch; (4) Scrubber curtain; (5) Counter-rotating side brushes; (6) Front, side and rear burshes; (7) Final pressure rinse; (8) Water reclaim.

B. Cost: $52,500.00

C. Code Ref: P-1002.6.5

III. Roll-Over System. (Option)

A. In this system the vehicle remains stationary and the washing system moves. One such system can handle vehicles from cars to trucks 14' high. Schedule of equipment. (1) Top and side brushes; (2) Pre-rinse arch w/injector; (3) Final rinse w/injector; (4) Operation controls; (5) Travel Track; (6) Dual guide rails; (7) Water, elec., air.

B. Cost: $50,000.00

C. Code Ref: P-1002.6.5

IV. Hand Wash/Rinse

A. A high pressure, hand held, wand sprays soapy water to clean any size vehicle. Same hose is then used to rinse or apply wax. Equipment consists of (1) Meter box (Section: Soap, rinse, etc.); (2) Ceiling mounted boom; (3) High pressure pumps; (4) High pressure hose; (5) Gun w/high pressure nozzle.

B. Cost: $12,000.00

C. Code Ref: P-1002.6.5

OILY AND FLAMMABLE LIQUID WASTE

I. Oil Separator

A. Where oily and flammable liquid wastes are produced, separators shall be installed into which all oil bearing, grease bearing, or flammable wastes shall be discharged before emptying into the building drainage system. Wastes other than those requiring treatment or separation shall not discharge into any separator. Size, type and location of each separator shall be approved by the Plumbing official.

1. Repair and Maintenance area.
2. Vehicle Storage.
3. Grease pits.
4. Vehicle wash bays
5. Fuel dispensing areas
6. Spraying booths.

B. Cost: $3,275.00

C. Code Ref: BOCA P-1002.0

LUBE AND FLUIDS

I. Central Fluids Distribution System.

A. The central distribution system shall consist of 55 gallon fluid drums, reel supply pumps, distribution piping and hose reel distribution sets. Can include; motor oil #1, #2, ATF, gear oil, water, chassis lube, air, anti-freeze, and windshield washer.

1. Lube bays.
2. Maintenance and repair shops.

B. Cost: $32,000.00

II. Portable Chassis Unit. (Option)

A. Includes 35 lb. or 120 lb. drums with pump, hose, nozzle and dolly. Requires compressed air supply to run pump at each possible distribution point. Can pump chassis lube, motor oils, gear oil and ATF.

1. Lube bays.
2. Maintenance and repair shops.

B. Cost: $14,000.00

SPECIAL CLEANING DEVICES

I. Oil or Gas Fired Pressure Cleaner.

A. Have water discharge capacities from 2.2 - 5 GPM, operating pressure range of 750 PSI - 1500 PSI at heat rise of 120 degrees F, hose lengths of 40' long are available. Oil fired burners can use kerosene, #1 Home heating oil or #1 or #2 Diesel. Gas fired burners use either LP or natural gas.

B. Cost: $5,000.00

II. Parts Washer.

A. Consists of a sink with a flow-thru brush, parts tray, electric pump w/swith, cleaning solution capacities from 5 to 20 gals with a fusable link lid support. Includes parts washer stand.

Options Available

1. Manual Diaphram Foot Pump.

B. Cost: $320.00

VEHICLE LIFTS

I. Two Post Swing Rail Drive-Thru Lift.

A. Designed for low clearence vehicles 77" drive-thru width. Quick spotting achieved by outside-in positioning of swing rails. Non-rotating capacity of 8,000 #, Rise 72", piston centers 90",initial oil fill 40 gal.

B. Cost: $8,000.00/ea.

II. Three Post Lift.

A. Front and rear jacks adjustable to varying wheelbase dimensions from fixed middle jack. Vehicles supported by axles or other adjacent structural member. Rear and middle posts recede below floor level and are automatically covered by steel doors. Wheelbase ranges: Front to middle jack 102" - 204" and from middle to rear jack 42" - 80". Capacities of 54,000#s

B. Cost: $30,000.00/ea.

III. Mobile Hoist.

A. Individual, movable electric hoists designed for 48,000 - 72,000 lb. Total weight will be utilized for flexibility.

B. Cost: $25,000.00 - $30,000.00

PAINT STORAGE

I. Storage Cabinets.

A. An approved cabinet, vent @ top and bottom, is acceptable for paint storage of 20 gallons or less. Storage of 20 - 100 gallons requires a double walled non-combustible cabinet vented directly to outer air. Various applications may be:

1. Carpentry shop.
2. Paint prep. room.
3. Sign shop.
4. Paint booth.

B. Cost: Double walled non-combustible cabinet, vented = $1,600.00/ea.

C. Code Ref: BOCA 611.3.3

II. Storage Rooms. (Option)

A. All spray materials of more than 100 gallons shall be stored in an enclosure of not less than two hour fire resistance rating or in a separate exterior storage building. If quantities of more than 250 gallons are to be stored, an isolated storage building is required. Exhaust fan with manual switch is the minimum recommended ventilation requirements.

B. Cost: $450.00

C. Code Ref: BOCA 611.3.3

OVERHEAD STANDARD TOP RUNNING CRANE

I. Single Girder Crane.

A. Capacity of 10 tons, lift of 18 feet single speed lifting, span of 60 feet.

B. Cost: $27,000.00

II. Double Girder Crane.

A. Capacity of 10 tons, lift of 18 feet, 2 speed lifting, span of 60 feet.

B. Cost: $34,000.00

FUEL DISPENSING SYSTEMS

I. Unattended fuel pumps (card operated).

A. Ease of operation along with security. System consists of: 8 pumps, card reader, controller, and printer. Various options are available but are not included in cost.

Options

1. Cassette Kit (Power Failure) beyond 72 hours.

2. Seven Vehicle Report (Vehicle Maintenance)

B. Cost: $45,500.00

II. Island Dispensers. (Option)

A. Computer or non computer models, automatic reset, vertical positive displacement meter, 1/3 H.P. motor, normal delivery 1.5 GPM, locking nozzle, ticket printers for either comulative or zero start reading, identifier wheels which print two letters AA-KK, i.e., AA BB AB BC etc.

B. Cost: $38,000.00

FUEL INVENTORY MONITORING

I. Ultrasonic Tank Monitoring.

A. This system uses a microprocessor computer w/ultrasonic measurements. Each tank monitor can control up to 8 tank probes. All information is displayed or printed on site. Automatically monitors all tanks when in shut down mode (after hours) and provides printout upon power up.

B. Cost: $10,800.00

STORAGE TANK PIPING

I. Pipe.

A. Std. weight black or galvanized iron pipe or UL approved non-metallic pipe, 1 1/2" or 2" pipe is generally used, follow pump manufactures recommendations.

B. W/suction type pumping systems, underground gasoline lines should slope uniformly down to tank from pump.

C. Gasoline line should be approximately 18" below finished grade @ pump island.

D. Minimize leaks by use of:

1. Swing joints.
2. Flexible connections.

At the point where they leave underground tank and at their termination at pump island and vent risers.

E. Flex hose and permanently attached pipe nipples must bear UL label.

F. Code Ref: ASPE Databook Volume 2 Chapter 11

II. Venting.

A. Each tank vented w/adequate size pipe to prevent blow back at fill opening, experience indicates that 1 1/2" or 2" vents are adequate for current flow rates.

B. Should be laid so that pipe is at least 12" below grade, sloping uniformly to tank.

C. Swing joints and flex. con. should be installed.

D. Galv. or black iron or non metalic.

E. If nonmetalic pipe special adapters are required for trans. between pipe and the galv. swing joint or between the nonmetalic pipe and flex. con.

F. Code Ref: ASPE Databook Volume 2 Chapter 11

III. Trenches.

A. Min. 6" deep bed of non-corrosive material.

B. All trenches should be wide and deep enough for min. 6".

C. If non-metalic pipe still recommend 6" fill for protection against corrosion.

IV. Cost: $13,800.00

COMPRESSED GASES

I. Fuel Gas Cylinder Storage (Acetylene)

A. 2,500 cubic ft. of gas shall be permitted to be stored inside the building. This value (2,500 cubic ft.) does not include cylinders that are in actual use or attached ready for use. If protected by fire sprinkler system, gas storage may be increased to 5,000 cubic ft. For 2 storage areas to be permitted in 1 building they must be separated by at least 100 ft. Gas storage greater than mentioned may be done by use of separate room, walls from ceiling to floor fire rating of at least 1 hr. and at least one wall shall be exterior.

B. Cost: $350.00

C. Code Ref: NFPA 51-7

II. Oxygen Cylinder Storage.

A. Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials (especially oil and grease) a minimum distance of 20 ft. or by a barrier of noncombustible material at least 5' high having a fire resistance rating of at least 1/2 hour.

B. Cost: $350.00

C. Code Ref: NFPA 51-7

III. General Compressed Air.

A. Compressed air is required by sand blasting equipment, power tools, lube reel pumps, painting equipment and tire fill. The equipment requirements will be approximately 20 to 30 SCFM flow at between 80 psig to 140 psig. Two 7 1/2 HP to 10 HP compressors should be considered to provide less than a 35% duty cycle and to insure the number of starts an hour is below 10. Two seperate pressure reducing valves may be required if large variations in pressure are required to operate different pieces of equipment.

B. Cost: $12,000.00

ENERGY COSTS

I. Schematic Phase Estimates

A. A simplified energy analysis was performed, based on the followig assumptions:

1. Total Operating Days = 280

2. Average operating hours per day = 12
hours per day = 5 mos x 16 hrs x 30 days = 2400
+ 7 mos x 9 hrs x 30 days = 1890
4290 mo-hr

$$\frac{4290 \text{ mo hr}}{12 \text{ mo} \times 39 \text{ day}} \times 11.92 \frac{\text{hr}}{\text{day}}$$

3. Annual degree days heating = 8400

4. Summer design conditions: Indoor: See Table I in HVAC Summary

Outdoor: 90, 90% RH

5. Winter design conditions: Indoor: See Table I

Outdoor: -25 degrees F., 15 mph wind

6. See electrical sheet attached

The first year thermal energy costs, based on 100% gas fired usage is estimated to be $ 85,000. Use of biomass fuel pellets with gas would reduce thermal energy costs to approximately $62,000.00.

Electrical energy costs are estimated to be about $201,035.00 per year. The addition of a central energy management system could reduce total energy costs by 15 to 30 percent. An energy managment system has been included as a part of the electrical construction cost estimate.

POWER (UTILITY) COSTS

ASSUMPTIONS:

1200.00 min. charge first 200 KW
+ $5.55 /(KW) over 200 KW
+ $ .0475/KWH energy charge

Monthly Energy Costs: 600 KW (10 Hrs/Day) (22 Days/Mo) = 132,000 KWH/Month

132,000 KWH/Mo ($.0475 KWH) = $6,270.00

$5.55/KW (400 KW) = $2,220.00

$ 6,270.00 + $ 2,220.00 + $ 1,200.00 = $9,690.00/Mo

* This figure can be reduced by possibly as much as 25% with the installation of an energy management system.

ELECTRICAL

I. Power Service and Distribution.

A. The primary service to the facility will be 12,470V which will be stepped down to a 480/277 V, 3Ø, 4 wire, wye connected power distribution system by means of a pad mounted transformer, located outside the facility. The transformer will be provided by the Marquette Board of Light and Power. A 480/277V power system is recommended because it allows the majority of the lighting in the facility to be powered by the 277V side of the service, therefore, reducing (1) the total service amperage to the facility and (2) the total transformer (KVA) required for 208/120V power. Initial calculations show that (approximately) a 1200 amp service will be required to provide adequate power to the facility, this translates into a 1000 KVA pad mounted transformer. The pad mount transformer will feed a 1200 amp main distribution panel which will then feed; larger 480V equipment (requiring separate circuits), some 480V , 3Ø panels to feed smaller 480V, 3Ø equipment, some 480/277V primary, 208/120V secondary transformers for receptacle and small power loads and 480/277V panels used for lighting. The 480/277V panels will also be used to feed smaller 480/277V primary, 218/120 V secondary transformers for receptacles and small equipment loads.

II. Primary Service.

A. The Primary (12,470 V) service to the facility will be brought to the pad mount transformer underground from a power pole located near the site property line and the secondary feeders from the pad mount transformer to the main distribution panel inside the facility will also be run underground. Underground service feeders for the facility are recommended due to the aesthetics associated with this type of service even though they are more costly.

III. Secondary Distribution; Shop Areas.

All the wiring in the facility will be run in conduit or some form of raceway. In the shop area where equipment will be placed such that conduit routing to the equipment would be unfeasible and plugging into an outlet on the wall would make walking around the equipment hazardous, and stubbing conduit up through concrete slab has no flexibility. There are two good options;

1. Overhead busway

2. Underfloor duct

a. Overhead Busway -

Overhead busway is a method in which a bus is run overhead suspended from the ceiling and cord and plug attachments are hung from it to the piece of equipment.

b. Underfloor duct -

Underfloor duct is a raceway system that is run in the concrete slab and has inserts that are spaced 24" on center. The raceway is covered by concrete, where the inserts are (every 24") the concrete is thin and can be broken with a hammer and removed and a receptacle can be installed then the piece of equipment is plugged in and placed over the receptacle which in turn hides the receptacle and gets the cord and plug out of the way. When the piece of equipment is to be moved, the receptacle is removed, the cap replaced and the insert grouted over.

The underfloor duct system is recommended because with this system there are no cables hanging from the ceiling which makes the installation neater and more safe. The cost of the two systems are comparable.

IV. Secondary Distribution; Open Office Areas.

A. In the open office areas such as drafting and computer the underfloor duct system is also desirable due to the fact that the work stations can be situated in the center of the space as well as around the walls, and stubbing conduit up through the concrete slab has no flexibility. Telephone and data cables can be run in a separate duct run along side of the power duct. Another alternative to the underfloor duct system is flat conductor cable (FCC) which is run under the carpeting, the system is very flexible but costly, special carpeting is also required. The underfloor duct system is recommended.

LIGHTING

I. Lighting.

A. The majority of the lighting in the office/engineering area including the lunchroom, lockers, all shop areas, tool crib, hand tool area, loading, foreman office and corridors will be fluorescent fixtures for its relatively good color, high efficiency and relatively low cost. The lighting in the warehouse, repair area, cold storage, cargo area, exterior security and site lighting and parking garage will be high pressure sodium fixtures for its color, high efficiency and good light distribution. Lighting in the paint preparation area, paint booth, painting and welding will be high intensity discharge light fixtures suitable for the hazardous locations in which they will be installed. Incandescent lighting will be used in closet spaces and janitors closets due to its low costs, some incandescent down lighting will be used in the lobby/reception area due to its aesthetic appeal.

TELEPHONES

I. Telephones.

A. An empty raceway system complete with outlet boxes and terminal cabinets will be provided at locations requested by public works officials. It is recommended that the telephone system be purchased by the client to allow optimal advantages and options of the many various systems. Also due to the fact that if the electrical contractor provides the system the contractor will purchase a complete system, usually installed by the supplier, and mark it up for the contractors overhead and profit and then sell it to the client. These additional costs can be avoided by purchasing the telephone system under a separate contract.

FIRE PROTECTION AND ALARMS

I. Alarms.

A. The National Fire Protection Association (NFPA) requires that a manual or automatic fire alarm system be installed in the facility where the automatic sprinkler system is not being installed. These areas include: All shop areas excluding paint booth areas, storage areas and warehouse. If there is a 2 hour fire wall separating the engineering/office area from the rest of the facility a fire alarm system in that area would not be required, however, for safety reasons it would be recommended. An automatic fire alarm system is recommended over a manual system for safety purposes only, no human factor is required to initiate the alarm. The fire alarm system will be complete with smoke/heat detectors, manual pull stations, audible (bell) devices, annunciator and control panels. The fire alarm system is required to sound an audible alarm at a continuously manned location for purposes of initiating emergency action. This will require that either the fire alarm system be interfaced with the fire department or that there be a 24 hour manned control station at the facility. Unless a 24 hour personnel position is projected for the facility, an interface with the fire department is recommended.

SECURITY SYSTEMS

I. Security Systems.

A. In addition to the security lighting that will be used around the exterior of the facility, and in addition to the keyed locks that will be incorporated into the doors, there are a large number of security systems that can be incorporated into the facility, from special lock system to sophisticated electronic systems using motion and vibration detectors. Without knowing what type of security problems the existing facility is suffering or how secure the city would like to make the new facility a recommendation regarding security systems cannot be made at this time.

ELECTRONIC COMMUNICATIONS

I. Electronic Communications.

A. In this facility a sound-P/A (public address) system shall be incorporated, the public address or intercom system can be incorporated several different ways. The two main systems are either (1) in the phone system or (2) in the sound system. If the P/A system is incorporated into the sound system, microphones will be placed at the amplifier location and at specified locations throughout the facility. This system would then be incorporated with the phone system and when someone is paged they would be informed as to who to contact, over the phone, for instructions. If the P/A system is incorporated as part of the phone system, a person could be paged over the system and could respond without having to pick up the phone (hands free). This system would also allow anyone to page anyone else, without having to call or go to a specified microphone location. Both of these systems have advantages and disadvantages.

The main disadvantage to having the P/A system as part of the phone system is the need for many more phone locations so that everyone is relatively close to a phone. The main disadvantage to the microphone system being incorporated into the sound system is that an operator would have to be contacted first, the message given to that person and that person transmitting the message over the sound system and then the person being sought after would have to get to a phone and call the person with instructions. This indicates that there is an additional person (the operator) involved with the system.

Another possibility would be to incorporate both systems into one, the offices could incorporate the phone system option (Option #1) and all other areas could use the sound system option (Option #2). A recommendation cannot be made without knowing how the present system is used (or abused) or how effective the existing systems satisfy the existing facilities needs.

SPECIAL ELECTRICAL SYSTEMS

I. Special Electrical Systems.

A. An emergency power system is required for this facility to operate the emergency (Egress) lighting and the fire alarm system. This can be accomplished several different ways. In all cases except emergency generator the fire alarm system will be required to have a battery backup power supply.

1. Storage Battery.

This system requires that small battery packs supply DC power to specified lighting during a power failure for a minimum of 1 1/2 hours. This system is good if it is maintained regularly but more often than not the batteries are neglected and after a period of time lose their electrical capability and when a power failure occurs the occupants are left in the dark. The advantage to this system is that initial costs is relatively inexpensive.

2. Generator Set.

This system requires that a type of generator (diesel or gas) of sufficient KVA size be installed in conjunction with an automatic transfer switch (for this facility a relatively small generator would be required). When the transfer switch senses a drop in voltage to the normal service it starts the generator which supplies power to specific portions of the electrical distribution system. This method of providing emergency power is very effective and also expensive and requires relatively high degree of maintenance.

3. Uninterruptible power supplies.

This system is another type of battery system that produces AC voltage to specified loads. This system also closely monitors the input voltage and compensates for power fluctuations (surges and drops) and utility substation transfers. This system is very effective but is used primarily for computer system, advanced telecommunication systems and other sophisticated solid state electrical systems. The system is also very costly.

4. Separate Service.

This system if allowed by the authority having jurisdiction (building code inspector/electrical) is a system by which two separate electrical services (separate city circuits) are brought to the facility through an automatic transfer switch which will sense the power in both lines and if one line (city circuit) loses power the transfer switch will transfer power to the other line (city circuit). This system is quite effective but obviously if both city circuits are lost the whole facility loses power, which makes the system not quite as effective as the emergency generator system. Costs are comparable.

The real advantage to this system is that it allows the entire facility to operate as usual if power to one of the lines is lost, with the emergency generator system, due to costs, only a small portion of the facilities electrical system would be allowed to operate.

Two power lines (city circuits) are available in the area making this system available for the facility. Either one of these systems, battery back-up = least costly, emergency generator = most efficient or separate services = most usable capacity. is recommended for this facility based on what capacity the facility needs (wants) for emergency power. The total system that is required to be connected to an emergency power source, emergency (Egress) lighting, and fire alarm system.

GENERAL SPACE REQUIREMENTS

I. General Space Requirements.

A. Space needed for the electrical distribution system will consist of a large (approximately 12' sq.) main electrical room located near the pad mount transformer area, another large electrical room will be required near the center of the facility for the motor control centers and miscelaneous controllers. This space could be incorporated with the main mechanical room.

In addition to the large electrical rooms needed, an additional small (approximately 4' sq.) will be required in the office area, the repair area, the shop areas and the garage area.

ENERGY MANAGEMENT SYSTEMS

I. Energy Management Systems.

A. This facility due to its size and regulated occupancy periods is a prime candidate for an energy management system.

There are two types of systems available.

a. Micro-processor system
b. Mini-computer system

An energy management system will accurately cycle fans, pumps, heaters, lighting, etc. to maximize their uses and minimize wasted energy.

a. Micro-processor system.

The micro-processor system is a programmable computer system that is capable of handling from 1 to 50 different items (points), each with its unique schedule.

b. Mini-computer system.

The mini-computer system is a programmable computer that is capable of doing everything a microprocessor system is capable of: scheduling, duty cycling, demand limiting, optimal start, monitoring and direct digital control. Plus the following: extensive graphics, special reports and studies, fire and security monitoring and detection and custom programming.

The mini-computer system is also capable of handling from 50 to an unlimited number of items (points).

Incorporating fire alarm and security systems into a mini-computer system can be more complicated, and can result in longer start up time for the initial installation, and more complicated troubleshooting if problems occur. These disadvantages have to be weighed very carefully against the advantages; (less initial equipment costs, graphic display of alarms as they occur and guiding quick and appropriate response to that location, and management of fan systems to control smoke in a building during a fire.)

When considering a facility this size for an energy management system, the mini computer system is recommended due to its versatility and ability to

handle as many items (points) as the facility will call for and incorporate all of them in one central system.

PUBLIC WORKS FACILITY

Power Distribution	-	Primary
Switchboard	-	$ 6,275.00 (1200A)
Ct/Pt Metering	-	$ 1,025.00 (1200A)
Distribution Section(s)	-	$ 4,800.00 (1200A)
CCT Brkrs	-	$ 700.00 (2-100A)/3P
		$ 3,000.00 (2-400A)/3P
	-	$ 1,825.00 (1-600A)/3P
	-	$ 1,800.00 (6-60 A)/3P
Switchboard Instruments	-	$ 3,750.00 (Volt, amp and Watt Meters)
TOTAL	-	$23,175.00

Feeder (Primary) 1600 (12.35)	-	$19,760.00 (Conduit)
	-	$ 3,500.00 (Trench and Backfill)
	-	$19,680.00 (Cable)
	-	$1,200.00 (Secondary)
TOTAL	-	$44,140.00

Secondary Distribution

Dry type transf. 4-30 KVA (2100.00) + 1-112 KVA (5,400.00)	-	$13,800.00
225A 480/277V Pnls. 6(1,100.00)	-	$ 6,600.00
225A 208/120V Pnls. 6(1,100.00)	-	$ 6,600.00
Disc. Switches (200A) (15)(430.00)	-	$ 6,450.00
Disc. Switches (100A) (10)(290.00)	-	$ 2,900.00
TOTAL	-	$36,350.00

Automatic Transfer Switch	-	$16,700.00

Lighting

Recessed fluor. (100)(210.00)	-	$ 21,000.00
Pendant ind. fluor. (225)(110.00)	-	$ 24,750.00
H.P.S. High Bay (135)(600.00)	-	$ 81,000.00
Explosion Proof (20)(750.00)	-	$ 15,000.00
Site Lighting (25)(1,700.00)	-	$ 42,500.00
Exit Lights (75)(75.00)	-	$ 5,625.00
Security Lighting (25)(350.00)	-	$ 8,750.00
TOTAL	-	**$198,625.00**

Motor Control Centers	-	$ 10,800.00

Devices

SW-$.18/sq.ft(90,000)	-	$ 16,200.00
Rec.-.96/sq.ft.(60,000)	-	$ 57,600.00
U.F. duct(2500)(6.85)	-	$ 17,125.00
TOTAL	-	**$ 90,925.00**

Conduit and Wire $.141 (95,000)	-	$ 13,395.00
Energy Managment System	-	$ 50,000.00

Sound System

10,000 (.12)	-	$ 1,200.00
40,000 (.31)	-	$ 12,400.00
15,000 (.31)	-	$ 4,650.00
TOTAL	-	**$ 18,250.00**

Fire Alarm

10,000(.27)	-	$ 2,700.00
20,000(.30)	-	$ 6,000.00
TOTAL	-	**$ 8,700.00**

Lightning Protection

85,000 (.16)	-	$ 13,600.00
TOTAL	-	$421,185.00

PUBLIC WORKS SERVICE CENTER

CONVENTIONAL CONSTRUCTION - SPRING 1987

OPTION 1 - MASONRY/STEEL SKELETON

Project Summary

A.	Engineering/Legal/Professional	$ 230,508.00
B.	Land Acquisition	$ 140,000.00
C.	Site Preparation	$ 630,000.00
D.	Construction - Main Building	$ 3,802,845.00
E.	Construction Engineering (Site inspections 20 hrs. per week)	$ 48,000.00
F.	Fixture and Equipment	$ 175,000.00
	Subtotal	$ 5,026,353.00
	Contingencies (5 %)	$ 251,317.00
	TOTAL	$ 5,277,670.00
	PROJECTED SAVINGS - Using Construction Management	$ 323,242.00
	TOTAL C/M PROJECT	$ 4,954,428.00

PUBLIC WORKS SERVICE CENTER

CONVENTIONAL CONSTRUCTION - SPRING 1987

OPTION 2 - PRE-CAST PANEL/STEEL SKELETON

Project Summary

A.	Engineering/Legal/Professional	$ 214,930.00
B.	Land Acquisition	$ 140,000.00
C.	Site Preparation	$ 630,000.00
D.	Construction - Main Building	$ 3,503,278.00
E.	Construction Engineering (Site inspections 20 hrs.per week)	$ 48,000.00
F.	Fixture and Equipment	$ 175,000.00
	Subtotal	$ 4,711,208.00
	Contingencies (5 %)	$ 235,560.00
	TOTAL	$ 4,946,768.00
	PROJECTED SAVINGS - Using Construction Management	$ 351,220.00
	TOTAL C/M PROJECT	$ 4,595,548.00

PUBLIC WORKS SERVICE CENTER

CONVENTIONAL CONSTRUCTION - SPRING 1987

OPTION 4 - STEEL SKIN/STEEL SKELETON/COMPONENT PURCHASE

Project Summary

A.	Engineering/Legal/Professional	$ 216,287.00
B.	Land Acquisition	$ 140,000.00
C.	Site Preparation	$ 630,000.00
D.	Construction - Main Building	$ 3,529,380.00
E.	Construction Engineering (Site inspections 20 hrs.per week)	$ 48,000.00
F.	Fixture and Equipment	$ 175,000.00
	Subtotal	$ 4,738,667.00
	Contingencies (5 %)	$ 236,933.00
	TOTAL	$ 4,975,600.00
	PROJECTED SAVINGS - Using Construction Management	$ 353,547.00
	TOTAL C/M PROJECT	$ 4,622,053.00

PUBLIC WORKS SERVICE CENTER

CONVENTIONAL CONSTRUCTION - SPRING 1987

OPTION 5 - STEEL SKIN/STEEL FRAME/PRE-ENGINEERED

Project Summary

A.	Engineering/Legal/Professional	$ 186,558.00
B.	Land Acquisition	$ 140,000.00
C.	Site Preparation	$ 630,000.00
D.	Construction - Main Building	$ 2,957,670.00
E.	Construction Engineering (Site inspections 20 hrs.per week)	$ 48,000.00
F.	Fixture and Equipment	$ 175,000.00
	Subtotal	$ 4,137,228.00
	Contingencies (5 %)	$ 206,861.00
	TOTAL	$ 4,344,119.00
	PROJECTED SAVINGS - Using Construction Management	$ 304,951.00
	TOTAL C/M PROJECT	$ 4,039,168.00

LIFE CYCLE COST ANALYSIS

	ALTERNATIVE A PRECAST PANEL	ALTERNATIVE B STEEL SKIN-COMPONENT
Purchase Price	$4,595,548.00	$4,622,053.00
Annual Operating Cost *	$ 199,810.00	$ 208,800.00
TOTAL FIRST COSTS	$4,795,358.00	$4,830,853.00
Capital Recovery Factor		
40 yrs @ 10 %	.10226	.10226
EQUIVALENT ANNUAL	$ 490,373.00	$ 494,003.00
Capital Costs		
Annual Maintenance Costs **	$ 500.00/yr.	$ 2,000.00/yr.
TOTAL EQUIVALENT ANNUAL COST	$ 490,873.00	$ 496,003.00

* Calculated from first year energy consumption estimates.

** Estimated annual maintenance costs.

JUSTIFICATIONS FOR NEW FACILITY

In 1981 - 82 vehicle maintenance operations costs were given at $605,229.00. By moving to a new facility, centrally located, an estimated savings of $101,000 could be achieved. Please refer to page 5 of the preliminary feasibility study report section "Discussion of Economic Decision". This section outlines these and other factors which enter into the decision to construct a new facility.

New opportunities arise for the "sale" of vehicle and equipment maintenance services to other public organizations such as the Board of Light and Power, the school system, and the transit authority. Assume a 2 man crew works full time, two shifts for outside services, and each man is paid $10.00 per hour, and his time is sold for $20.00 per hour, this would generate revenues of $166,400.00, with costs of approximately $124,800.00. This leaves a surplus of $41,600.00. This is hypothetical, but not unrealistic.

Besides the benefits laid out here and in the preliminary feasibility study, there are other potential benefits to the community. One would be the potential jobs produced by the use of wood pellets for fuel. The use of such fuel by this facility would help justify the construction of a biomass fuel plant in Marquette or the vicinity. Such a plant would provide between 1 and 20 full time production jobs, not to mention the secondary job market. Secondary jobs would be in the form of salespeople, pickup and delivery services, raw material suppliers, truckers, and maintenance supplier work, to mention a few.

It is difficult to talk in terms of savings alone, but briefly stated, costs for operating such a facility would be, on a square foot basis, less then current costs. The following summarizes the major costs and savings on a total dollar basis.

To go to the new facility:

Vehicle Maintenance/Operations

$101,229.00 savings

Energy: Additional Cost: $135,000.00

Facility Maintenance Outside

Contractors $21,000 savings

Management Savings in Operation

$14,850.00

The only cost not offset by savings is the cost of money. Another factor to consider is that in a short time, a new facility will be required anyway.

POTENTIAL INCOME FROM GAS SALES

Assumes 35,000/year sales to Marquette County and the public school system.

35,000 x .10 = $ 3,500.00/year.