DANE COUNTY DEPARTMENT of PUBLIC WORKS, HIGHWAY and TRANSPORTATION

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Commissioner / Director
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JANUARY 11, 2013

ATTENTION ALL REQUEST FOR PROPOSAL (RFP) HOLDERS

RFP NO. 312034 - ADDENDUM NO. 2

DESIGN SERVICES FOR MECHANICAL, ELECTRICAL & PLUMBING INFRASTRUCTURE IMPROVEMENTS

PROPOSALS DUE: THURSDAY, JANUARY 17, 2013, 2:00 PM. DUE DATE AND TIME ARE NOT CHANGED BY THIS ADDENDUM.

This Addendum is issued to modify, explain or clarify the original Request for Proposal (RFP) and is hereby made a part of the RFP. Please attach this Addendum to the RFP.

PLEASE MAKE THE FOLLOWING CHANGES:

1. Supplementary Content

Page SC-1 - Item 3.B.:

Change:

"B. Four studies will be included via Addendum:
1. Part 1 - Report for Existing HVAC Cooling Equipment Study
2. Part 2 - Report for HVAC Equipment Options & Cost Estimates
3. Part 1 - Report for Electrical Infrastructure & Generator Capacity Study
4. Part 2 - Report for Electrical Infrastructure & Emergency Power Generator Options & Cost Estimates "

To:

"B. Three studies will be included via Addendum:
1. Report for HVAC Equipment Analysis, Options & Cost Estimates
2. Part 1 - Report for Electrical Infrastructure & Generator Capacity Study
3. Part 2 - Report for Electrical Infrastructure & Emergency Power Generator Options & Cost Estimates "

Delete current "Part 1 - Report for Existing HVAC Cooling Equipment Study"; replace with new report, "Report for HVAC Equipment Analysis, Options & Cost Estimates", issued with this Addendum.

Note: It was stated there would be four reports from Henneman Engineering. This has been reduced to three reports by combining two of the HVAC reports into one.

Part 1 - Report for Electrical Infrastructure & Generator Capacity Study - cover page:
Change: “ August 28, 2012 ”, to: “ October 11, 2012”.

Add new document, “Part 2 - Report for Electrical Infrastructure & Emergency Power Generator Options & Cost Estimates”, issued with this Addendum.

If any additional information about this Addendum is needed, please call Scott Carlson at 608/266-4179, carlson.scott@countyofdane.com.

Sincerely,
Scott Carlson
Project Engineer

Enclosures:
Report for HVAC Equipment Analysis, Options & Cost Estimates *(attach to Supplementary Content section)*
Part 2 - Report for Electrical Infrastructure & Emergency Power Generator Options & Cost Estimates *(attach to Supplementary Content section)*

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Dane County
Department of Public Works, Highway & Transportation
Madison, Wisconsin

Report for

HVAC Equipment Analysis, Options & Cost Estimates

Dane County 911 Center Radio Systems Upgrade City-County Building

October 31, 2012

Dane County Project #312023
Henneman Engineering Project #12-7582C

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Executive Summary

The HVAC cooling equipment serving the major equipment rooms of the 911 Center in the City County Building (CCB) is not sufficient for the current operations, nor is the distribution system properly balanced. Two major upgrades are currently planned for the 911 Center: 1) emergency radio communications upgrade; and 2) computer aided dispatch equipment and systems upgrades. Besides these upgrades the addition of disaster recovery equipment is planned. The existing HVAC cooling equipment and distribution system is not sufficient for these projects either.

Introduction

This report is provided at the request of Dane County Department of Public Works, Highway & Transportation to analyze the existing cooling equipment serving portions of the 911 Center in the CCB. The spaces included are Radio Equipment Room 117, Computer Equipment Room 120, and the Telephone Equipment Room 121. These three spaces are served by two computer room air conditioning units, with a third unit intended to act as a redundant backup to either unit. Ongoing operational problems with these units were discussed with maintenance staff. These problems are addressed in this report. The capabilities and limitations of the units and the airflow distribution are discussed in regards to current operations and the planned upgrades. The cooling capacity calculation is based on information gathered about equipment present at the time of the last remodel as well as equipment added since that time. A cooling load calculation has been performed to assess whether the existing units have sufficient capacity. This cooling load calculation required an on-site survey to identify equipment added after the installation of the computer room units and verify all equipment heat gains. The results of these calculations are included.

Analysis

1. Existing Computer Room Air Conditioning Units

Radio Equipment Room 117, Computer Equipment Room 120, and Telephone Equipment Room 121 are served by three computer room air conditioning units. CRU-1 serves the computer equipment room and the telephone equipment room. CRU-2 serves the radio equipment room. CRU-3 is a redundant unit located in Storage 119. CRU-2 backs up either CRU-1 or CRU-2 but not both simultaneously.

Each unit has a chilled water cooling coil that provides the cooling and dehumidification. The cooling capacity of each unit is 5 tons (1 ton of cooling capacity equals 3.52 kW of heat removed). This capacity includes 4.5 tons of sensible capacity and 0.5 tons of latent capacity. Sensible capacity affects the room temperature. Latent capacity affects the relative humidity in the space. Refer to Appendix A for a summary of the existing cooling equipment capacities.

Because these units do not have the ability to reheat the air after it has been cooled, room temperature and relative humidity can't both be controlled simultaneously.

The supply air from CRU-1 is hard ducted from the unit to diffusers in the ceiling of Computer Equipment Room 120 and Telephone Equipment Room 121. The fan and motor of this unit are large enough to accommodate the static pressure caused by the ductwork. The motor is 2 horsepower.

The supply air from CRU-2 is not hard ducted. It is equipped with a distribution plenum that blows the air from the unit into Radio Equipment Room 117. The fan and motor in CRU-2 are large enough to accommodate the distribution plenum, but not large enough for ductwork. The motor is 1.5 horsepower.

The supply air from CRU-3 is hard ducted from the unit to diffusers in the ceiling of all three rooms. Motorized control dampers direct the air to either the Radio Equipment Room or the Computer Equipment

Room and the telephone equipment room. The fan and motor of this unit are large enough to accommodate the static pressure caused by the ductwork. The motor is 2 horsepower.

2. Existing Cooling Load Calculations

To calculate the cooling loads, the heat output of each piece of equipment is required. The equipment information was gathered from multiple on-site field surveys by Henneman Engineering with assistance from the 911 Center personnel. For some of the equipment identified in the survey heat output values are available from published manufacturer documents. For some equipment (for example the UPS), heat output was taken off the remodel project manufacturer submittals. For most of the equipment no heat output was available from the manufacturer, only nameplate power usage. Actual usage equates to heat output, but the nameplate power usage value typically overstates the actual power usage. Also any single piece of equipment does not run all the time. For this analysis it is assumed that the average heat output is equal to 40% of nameplate power usage.

Note that this initial analysis did not include future equipment upgrade projects (emergency radio communications upgrade, computer aided dispatch equipment and systems, and disaster recovery rack).

3. Radio Equipment Room 117

Cooling for the radio equipment room is provided by CRU-2.

Because CRU-2 does not have the ability to control both room temperature and relative humidity, it has been over-cooling the space in order to control the relative humidity.

CRU-2 is located in the southwestern corner of the room. The supply air blows from the unit out into the space. This configuration is not ideal because it precludes the use of a hot aisle / cold aisle strategy. The hot aisle / cold aisle strategy provides air distribution in which all the cold air is delivered at the electronic equipment's air inlets and all the hot air is collected at the electronic equipment's air outlets to be re-conditioned by the cooling equipment.

The sensible cooling load of this room is 3.6 tons. The capacity of CRU-2 is 4.5 tons. CRU-2 has sufficient sensible cooling capacity.

4. Computer Equipment Room 120 and Telephone Equipment Room 121

Cooling for the computer equipment room and the telephone equipment room is provided by CRU-1.

The sensible cooling load of these rooms is 6.6 tons. The sensible cooling capacity of CRU-1 is 4.5 tons. CRU-1 has insufficient sensible cooling capacity to maintain the room temperature in these spaces. To avoid over heating in these spaces, the redundant unit, CRU-3, has been over used to provide extra capacity for the Computer Equipment Room and the Telephone Equipment Room. On several occasions the control system failed to activate CRU-3 to provide additional cooling and the rooms began to overheat. Small temporary cooling units were installed in the Computer Equipment Room and the Telephone Equipment Room at that time.

Because the sensible cooling load of Computer Equipment Room 120 and Telephone Equipment Room 121 is greater than the sensible cooling capacity of CRU-3, it cannot provide cooling for these rooms if CRU-1 is not operating due to required maintenance. Also CRU-3 cannot simultaneously provide the supplemental cooling for the Computer Equipment Room and the Telephone Equipment Room and act as a redundant backup for CRU-2. For these reasons CRU-3 is not capable of acting as redundant backup unit as intended.

5. Planned Upgrades: Emergency Radio Communications Equipment & Systems, Computer Aided Dispatch Equipment & Systems, and Disaster Recovery Rack

New electrical loads to be added to the 911 Center will require additional cooling calculated to be 25,000 Btuh or 2.1 tons. Additional equipment modifications or changes will be required to properly condition the three rooms analyzed in this report.

Refer to Appendix B for these loads, reported to Henneman Engineering by 911 Center personnel.

6. Conclusions

CRU-1, serving Computer Equipment Room 120 and Telephone Equipment Room 121, does not have sufficient capacity to serve these rooms currently or for the planned upgrades.

CRU-2, serving Radio Equipment Room 117, has sufficient sensible capacity to control room temperature currently. The equipment is not capable of controlling relative humidity, except by over-cooling the space. CRU-2 is not capable of providing for a hot aisle / cold aisle strategy.

CRU-3 does not have sufficient capacity to provide backup cooling for Computer Equipment Room 120 and Telephone Equipment Room 121 currently or for the planned upgrades.

Options

Option 1 – Replace the three computer room units with new units of the same cooling capacity.

Dane County has expressed a strong desire for the current units to be replaced with new Liebert units. These new units would include separate control of room temperature and humidity. The first stage of humidity control is through variable airflow. If less cooling is needed to maintain room temperature, the airflow and the chilled water are reduced in tandem, maintaining the capacity of the unit to dehumidify the space. If additional dehumidification is needed, the cooling is increased and the heating water reheat is used to maintain room temperature at normal levels.

These units would include the ability to connect to the existing HVAC building automation system. This allows remote access to the units for turning on or off the units, monitoring room temperature and humidity, set point adjustment, and relaying unit alarms to Facilities Management.

These units would include canister humidifiers to maintain minimum room humidity levels. Infrared humidifiers are also available.

These units would also include high static motors for CRU-1, serving Computer Equipment Room 120 and Telephone Equipment Room 121, and CRU-3, the redundant backup unit. These high static motors are required due to the ducted supply air distribution in these rooms.

Implementing this option would solve problems with humidity control. It would not provide additional sensible cooling capacity. Therefore the third unit, intended as a redundant backup, would still be required to run nearly continuously to provide cooling for Computer Equipment Room 120 and Telephone Equipment Room 121. This option would not provide for hot aisle / cold aisle airflow distribution.

The estimated construction cost for Option 1 is $135,000.

Option 2 – Replace the three computer room units and airflow distribution ductwork with units and ductwork sized to provide sufficient cooling capacity for current and planned future equipment.

These three new Liebert units would include separate control of room temperature and humidity. The first stage of humidity control is through variable airflow. If less cooling is needed to maintain room temperature, the airflow and the chilled water are reduced in tandem, maintaining the capacity of the unit to dehumidify the space. If additional dehumidification is needed, the cooling is increased and the heating water reheat is used to maintain room temperature at normal levels.

These units would include the ability to connect to the existing HVAC building automation system. This allows remote access to the units for turning on or off the units, monitoring room temperature and humidity, set point adjustment, and relaying unit alarms to Facilities Management.

These units would include canister humidifiers to maintain minimum room humidity levels. Infrared humidifiers are also available.

These units would also include high static motors for all three units. These high static motors are required due to the ducted supply air distribution in these rooms.

CRU-1, serving Computer Equipment Room 120 and Telephone Equipment Room 121, would be replaced with a new computer room unit to provide sufficient cooling capacity for current and planned future equipment without the need to run the dedicated redundant unit (CRU-3). A possible computer room unit has 8.6 tons of total cooling capacity. Unfortunately, the sensible cooling capacity of this unit is just short of the sensible cooling capacity required by the heat output of the electrical equipment in the space. Therefore the next largest unit is required. It has a total cooling capacity of 11.4 tons with 9.7 tons of sensible cooling capacity. Choosing the unit with higher cooling capacity does not increase the physical size of the unit because both units have the same cabinet size. The motor size is also the same for both units because of the need for high static motors. The cost increase for the larger unit is less than $1400. Choosing the larger unit provides sufficient cooling capacity and has minimal impact on the design.

Existing storage shelves adjacent to the existing computer room unit in Computer Equipment Room 120 would have to be relocated to accommodate the new, larger unit. The unit is approximately 50” wide and 36” deep.

The increase in cooling capacity requires a corresponding increase in airflow quantity. The existing supply air ductwork would be replaced under this option.

CRU-2, serving Radio Equipment Room 117, would be replaced with a new, 5 ton computer room unit. The new unit would be able to independently control room temperature and humidity.

This unit is approximately 33” wide and 33” deep. Because it is slightly larger than the existing unit, it will not fit in the same location without infringing upon the clearance of the existing electrical panel. The existing desk on the north side of the room could be relocated to accommodate the new unit.

This unit would be provided with a ducted airflow discharge. The distribution ductwork could be designed to provide a hot aisle / cold aisle airflow distribution strategy.

CRU-3 would be replaced with a new, 11.4 ton computer room unit (sensible 9.7 tons). This unit would be large enough to provide backup cooling to either CRU-1 or CRU-2.

Under this option CRU-1 and CRU-2 would have sufficient cooling capacity for all current and future planned equipment. Therefore CRU-3 would not have to run continuously and could act as a true redundant unit in the case of unit failure.

Existing storage shelves adjacent to the existing computer room unit in Storage Room 119 would have to be relocated to accommodate the new, larger unit. The unit is approximately 50" wide and 36" deep. The new unit fits without disturbing the existing mobile shelving.

The increase in cooling capacity requires a corresponding increase in airflow quantity. If CRU-3 were to provide backup cooling for Computer Room 120 and Telephone Equipment Room 121, the increased airflow requires additional transfer ducts to return the airflow back to CRU-3.

The estimated construction cost for Option 2 is $190,000.

Recommendations

Henneman Engineering recommends the implementation of Option 2. The new computer room units in the computer room and the radio room will assure sufficient cooling capacity for all current equipment and all equipment planned for the future. The new unit in the storage room will function as a redundant backup, providing cooling in the event of the failure or maintenance of one of the other units. The new units will be able to separately control room temperature and humidity. The units will be provided with motors sufficient for ducted airflow, allowing for optimum air distribution within the rooms. Option 2 addresses the ongoing operational problems with the current units and prepares the 911 Center for upcoming equipment upgrades.

Appendix A

Existing Cooling Equipment Summary Table

Unit	Serves	Sensible Cooling Capacity (Tons)	Latent Cooling Capacity (Tons)
CRU-1	Computer Equipment Room 120, Telephone Equipment Room 121	4.5	0.5
CRU-2	Radio Equipment Room 117	4.5	0.5
CRU-3	Backup for CRU-1 and CRU-2	4.5	0.5

Appendix B

Equipment Room Sensible Cooling Load Table
Existing Equipment and Planned Upgrades

Room	Existing Sensible Cooling Load (Tons)	Planned Upgrade Sensible Cooling Load (Tons)	Total Sensible Cooling Load (Tons)
Radio Equipment Room 117	3.6	0.6	4.2
Computer Equipment Room 120*	5.5	1.2	6.7
Telephone Equipment Room 121*	1.1	0.3	1.4

* Computer Equipment Room 120 and Telephone Equipment Room 121 are served by one unit. The existing combined sensible cooling load is 6.6 tons; the future combined sensible cooling load is estimated to be 8.1 tons.

Dane County
Department of Public Works, Highway & Transportation
Madison, Wisconsin

Part 2 - Report for

Electrical Infrastructure & Emergency Power Generator Options & Cost Estimates

Dane County 911 Center Radio Systems
Upgrade City-County Building

November 9, 2012

Dane County Project #312022
Henneman Project Number 12-7582D

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Executive Summary

The existing electrical distribution equipment serving the 911 Center in the City County Building (CCB) is sufficient for the current operations and the two planned upgrades: 1) emergency radio communications upgrade; and 2) computer aided dispatch equipment and systems upgrades.

The existing emergency generator power source and associated electrical power feeder serving the 911 Center in the City County Building (CCB) is not sufficient to support these two major upgrades.

Replacement of existing 180 Kw 911 Center generator with a 250 to 275 Kw unit is recommended.

Introduction

This report is provided at the request of Dane County Department of Public Works, Highway & Transportation to analyze options to provide an additional emergency power source serving the 911 Center in the CCB to support the two upgrade projects. The electrical infrastructure consists of all the wiring, circuit breakers, switches, motors starters, emergency generator, automatic transfer switches & electrical panels serving the 911 Center systems excluding the third floor training space. The 911 Center's electricity is supplied by the public utility company (MG&E) but is required to have a backup power system to maintain operations, including heating, ventilation & air conditioning systems during loss of utility power. The existing emergency generator for the 911 Center is located in the sub-basement of the facility. The primary cooling equipment for the 911 Center is located in the mechanical penthouse and roof above the 7th floor – west portion of the building. All other electrical and mechanical equipment is located in the 911 Center. The Dane County Department of Public Works, Highway & Transportation requested Henneman Engineering analyze the options to provide additional emergency power source serving the 911 Center in the CCB and to determine the associated costs with each proposed option.

Analysis

1. Existing Conditions

    a. Existing electrical infrastructure system for the 911 Center was upgraded and installed in 1987. The 911 Center 2009 renovation did not replace or modify the existing electrical distribution or emergency power source.
    b. Existing 911 Center is served by a 400A, 480 volt automatic transfer switch (ATS) with an additional 200A, 208 volt ATS. The 400A ATS serves 911 Center equipment, mechanical heating, ventilation and cooling equipment. The 200A ATS serves 911 Center equipment and also provides for a redundant power system.
    c. The existing diesel emergency power source generator serving the 911 Center is rated at 180 Kw at 277/480 volt, 3 phase.

2. Previous Report

    a. Report for Electrical Infrastructure & Generator Capacity Study dated October 11, 2012 provided the following information:

        (1) Emergency Radio Communications Equipment and Systems:

            a) The anticipated impact on the 911 Center existing emergency generator and feeder system from the added loads will exceed the generator capacity by approximately 5 Kw.

        (2) Computer Aided Dispatch Equipment & System:

            a) The anticipated impact on the 911 Center existing emergency generator and feeder system from the added loads will exceed the generator capacity by approximately 20 Kw.

(3) Infrastructure

a) The existing electrical infrastructure system for the 911 Center is sufficient to support the two major upgrades and associated cooling equipment loads. Increased capacity of feeders and panel boards to selected areas will be required to be evaluated based on final equipment selection and locations.

(4) Conclusions:

a) The additional new electrical loads for the two planned upgrade projects and their associated cooling equipment loads may safely be added to the existing electrical infrastructure and electrical distribution system serving the 911 Center.
b) The additional new electrical loads for the two planned upgrade projects and their associated cooling equipment loads cannot be added to the existing emergency power generator serving the 911 Center.
c) Equipment (refer to Figure 1)
   (i) Option I: Replace existing emergency 180 Kw generator with new single larger unit to support added loads
   (ii) Option II: Add additional emergency generator to support added or reconfigured loads. Retain existing 180 Kw unit to continue to serve existing 911 Center loads.

Options

1. Option I (refer to Figure 1)

a. Remove existing 180 Kw generator in existing sub-basement location and replace with new 250-275 Kw generator in same location.

(1) Provide new larger power feeder from existing 180 Kw generator sub-basement location and connect to existing panel MDP-E located in the 911 Center. New feeder is required to be 2-hour fire protected from the generator location to the existing 911 Center.
(2) Provide temporary trailer mounted generator located on grade near existing 911 Center and temporarily connect to existing panel MDP-E located in the 911 Center. Temporary control wiring shall be provided for proper operation. (Previous location for temporary generator was on S. Carroll Street)
(3) Remove existing 180 Kw generator and replace with new 250-275 Kw generator.
(4) Existing exhaust piping to be upsized for larger unit.
(5) Existing area way and louvers for cooling air is adequate to support the new larger unit.
(6) Increased fuel consumption of larger unit will reduce the approximate 30 hours run time for existing units by approximately 2 hours.
(7) Existing 180 Kw generator may be relocated to another County facility or sold.
(8) All existing electrical distribution equipment in 911 Center to remain.
(9) New equipment for major upgrade projects shall be connected to existing 911 Center UPS distribution system.
(10) New air conditioning units shall be connected to existing mechanical distribution panel M in existing 911 Center.

b. Pros:

(1) Generator maintenance and testing remains similar to existing unit.
(2) All new work is located outside the existing 911 Center except for the disconnection and reconnection of existing feeder and new feeder to existing panel MEP-E for temporary and permanent system.

c. Cons:

(1) No back up capabilities if generator fails due to fuel, battery or other systems failure. This is the same as the current configuration.

2. Option II (refer to Figure 1)

a. Add additional 100-150 Kw emergency generator.

(1) Existing 911 Center 180 Kw generator located in sub-basement shall remain.
(2) Add new 100-150 Kw exterior rated diesel emergency generator. Grade mounting unit located adjacent to existing 911 Center does not appear a reasonable possibility due to space constraints and security concerns. Roof mounted above the 911 Center is limited due to distance requirements from existing ventilation air intakes. Refer to Figure 2 for possible roof location. Existing building structure must be evaluated prior to final design decision.
(3) Diesel fuel tank, pump, controls, supply and return piping shall be provided from accessible location to roof mounted generator. Fuel capacity of fuel tank shall be evaluated based on minimum run time desired. It is recommended that it be no smaller than that of the existing 911 Center generator fuel tank. Locating the new tank adjacent to existing 911 Center fuel tank would provide additional capacity for existing 911 Center generator but would require long runs of fuel lines to roof mounted generator. Acceptable route for fuel piping will need to be field verified.
(4) New acceptable power feeder routing from roof mounted generator to existing 911 Center will need to be field verified. New feeder is required to be 2-hour fire protected from the generator location to the existing 911 Center.
(5) Convenient access for maintenance of roof mounted generator must be evaluated.

b. Pros:

(1) Additional generator may serve as a redundant back up unit to existing 911 Center generator.
(2) All new work is located outside the existing 911 Center except for the disconnection and reconnection of existing feeder and new feeder to existing panel MEP-E for temporary and permanent system.

c. Cons:

(1) Additional maintenance for unit, fuel piping and storage.
(2) Exterior unit less desirable than interior unit for maintenance.
(3) Existing roof structure may not be able to support additional weight.
(4) Physical routing for fuel piping, controls and power feeder.
(5) Large crane in street (W Doty St) to boom generator in place.

3. Distribution Option IIA (refer to Figure 3)

a. Generator feeder from roof mounted generator may be connected to the existing 75Kva step down transformer currently connected to existing MDP-E. The existing 75Kva step down transformer currently serves existing transfer switch ATS B. The existing transfer switch ATS B currently serves all the 208 volt distribution for the 911 Center.

b. The existing 75 Kva step down transformer currently connected to existing MDP-E would be disconnected from existing 911 Center 180 Kw generator.

c. Pros:

(1) Minimize disruption to the existing 911 Center distribution system.

(2) Each existing automatic transfer switch for the existing 911 Center would be served by separate generators.
(3) Existing UPS distribution for the existing 911 Center is currently divided between each transfer switch. Existing 911 Center equipment is served from each UPS system. Failure of either generator would still allow half of the 911 Center equipment to function.

d. Cons:

(1) None

4. Distribution Option IIB (Refer to Figure 3)

a. Same as Distribution Option IIA above with manual tie connection between existing 180 Kw 911 Center generator and new roof mounted generator.

b. Larger size new generator may be considered to support additional loads in the event the existing 180 Kw 911 Center generator fails.

c. Kirk key interlock cylinders are required for manual control for each generator main breaker and tie breaker between units.

d. Pros:

(1) Provides backup capabilities to selected 911 Center loads in the event one or the other generator fails to operate when required due to fuel, battery or other systems failure.

e. Cons:

(1) Additional costs.
(2) Requires knowledgeable trained staff to operate kirk key cylinders.
(3) Additional space required in the existing 911 Center electrical room for additional breakers.

5. Distribution Option IIC (Refer to figure 4)

a. As an alternative load for the new generator feeder from roof mounted generator, the feeder may be connected to the existing mechanical panel M. Existing panel M currently serves mechanical equipment for 911 Center. The panel is intended serve the new replacement air conditioning units located in the Radio Equipment Room 117, Computer Equipment Room 120 and Telephone Equipment Room 121.

b. A new automatic transfer switch is required to connect the new generator feeder to existing panel M. Control wiring is required between the new automatic transfer switch and existing automatic transfer switch ATS A. Control wiring is required to prevent the new transfer switch from switching from back the existing 911 Center generator when operating.

c. Additional space within the existing air handling room will be required to mount the new automatic transfer switch.

d. Pros:

(1) Provides convenient load separation from existing 911 Center generator.

e. Cons:

(1) Additional costs than Distribution Option IIA.
(2) Distribution Option IIB not possible with this distribution option

(3) Increases control complexity.
(4) Additional space required in the existing air handling room for new automatic transfer switch.

6. Opinion of Probable Costs

   a. Option I: Estimated construction costs: $325,000

   b. Option II: Estimated construction costs: $400,000

   c. Option IIA: Estimated construction costs: $10,000 (additional)

   d. Option IIB: Estimated construction costs: $60,000 (additional)

   e. Option IIC: Estimated construction costs: $30,000 (additional)

Recommendations

1. In order to support the two major upgrades that are currently planned, Option I is recommended to minimize construction cost.

2. Option II with Distribution Option IIB would be recommended if additional redundancy is of a higher priority.

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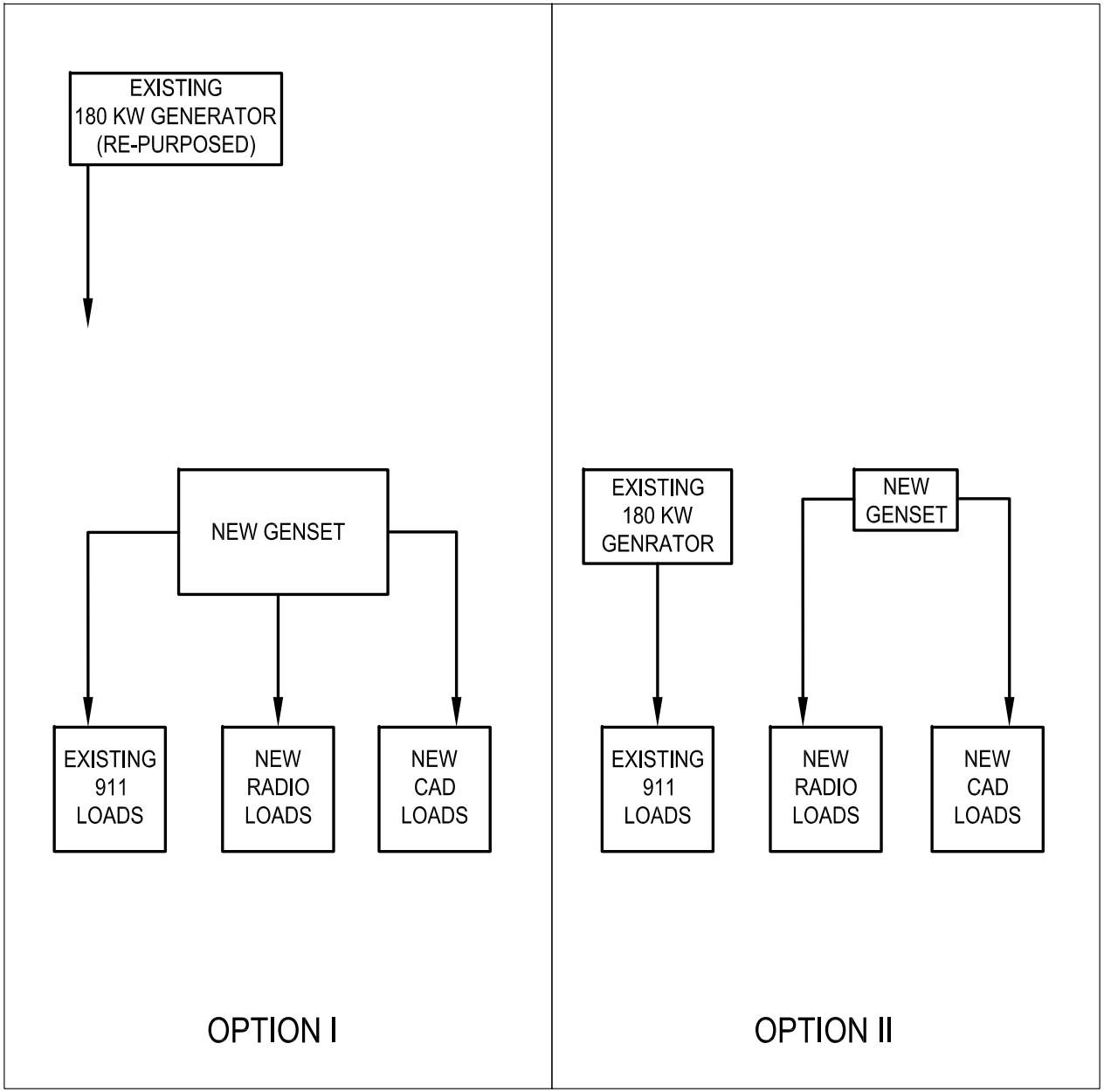

FIGURE I

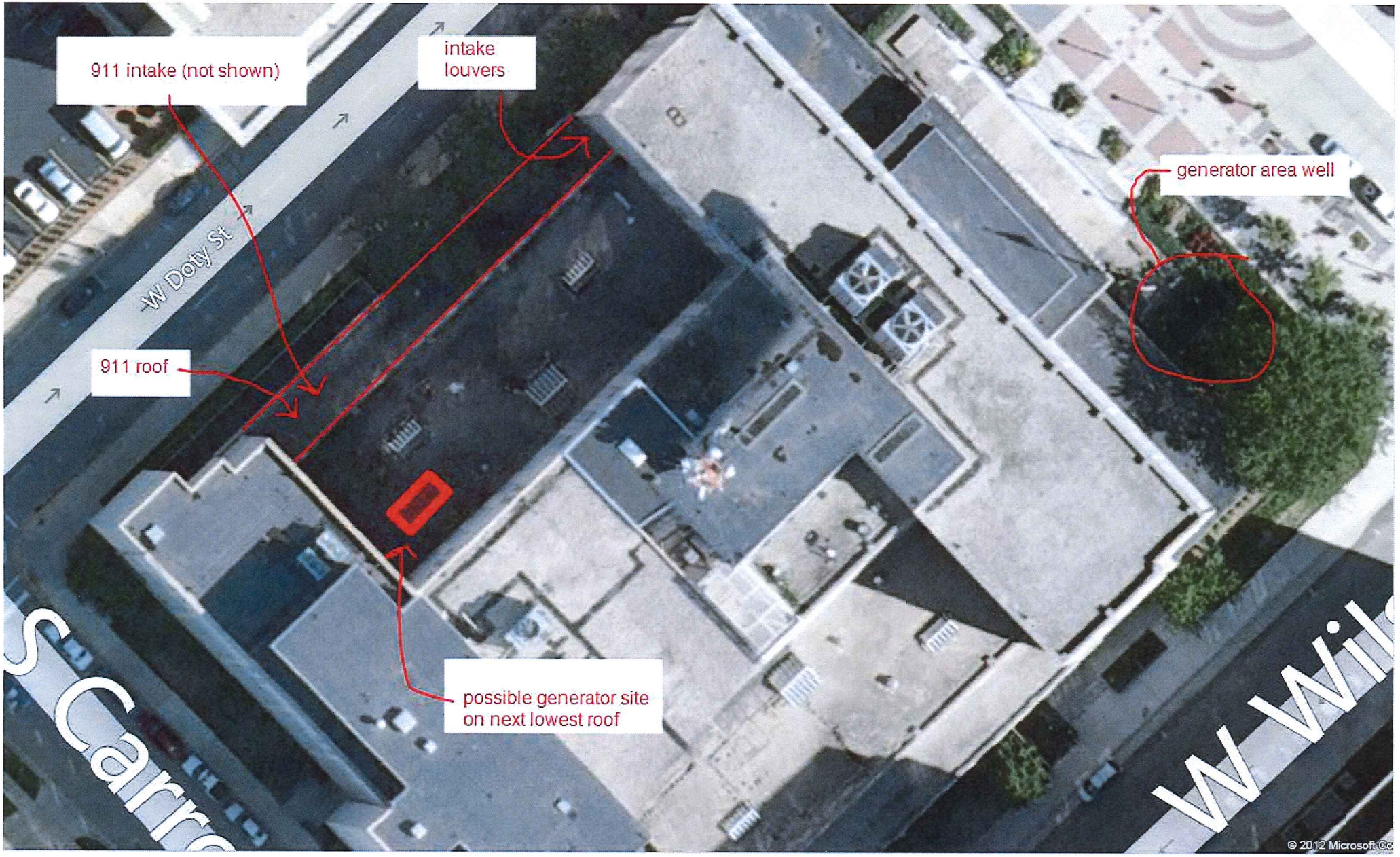
911 intake (not shown)
intake louvers
generator area well
W Doty St
911 roof
possible generator site on next lowest roof
S Carro
W Wil
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FIGURE 2

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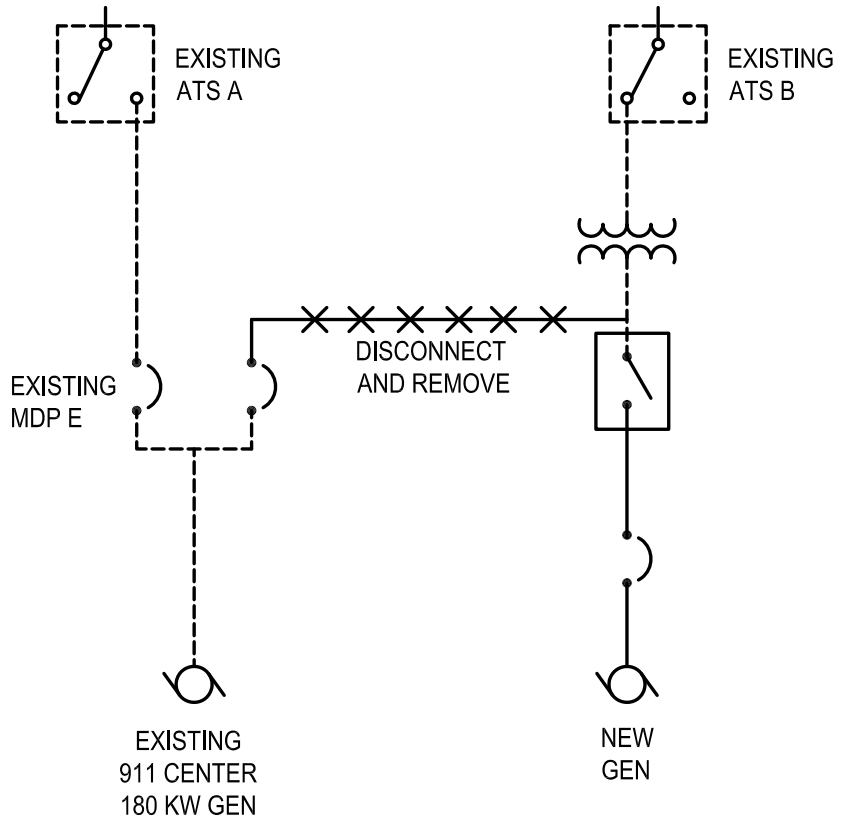
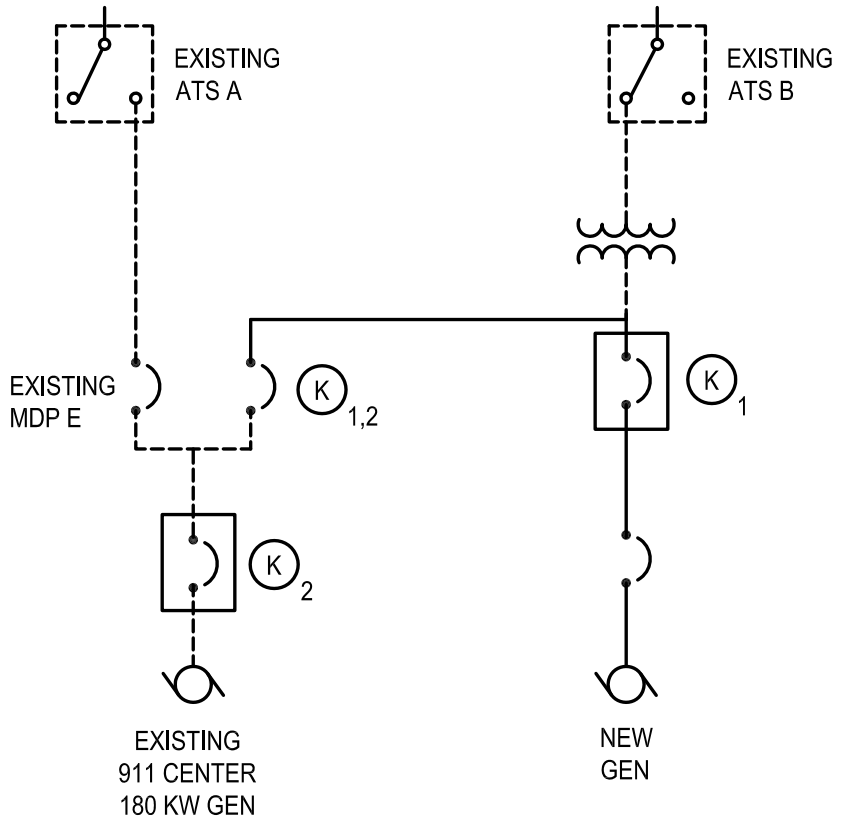


DISTRIBUTION OPTION II A



DISTRIBUTION OPTION II B

FIGURE 3

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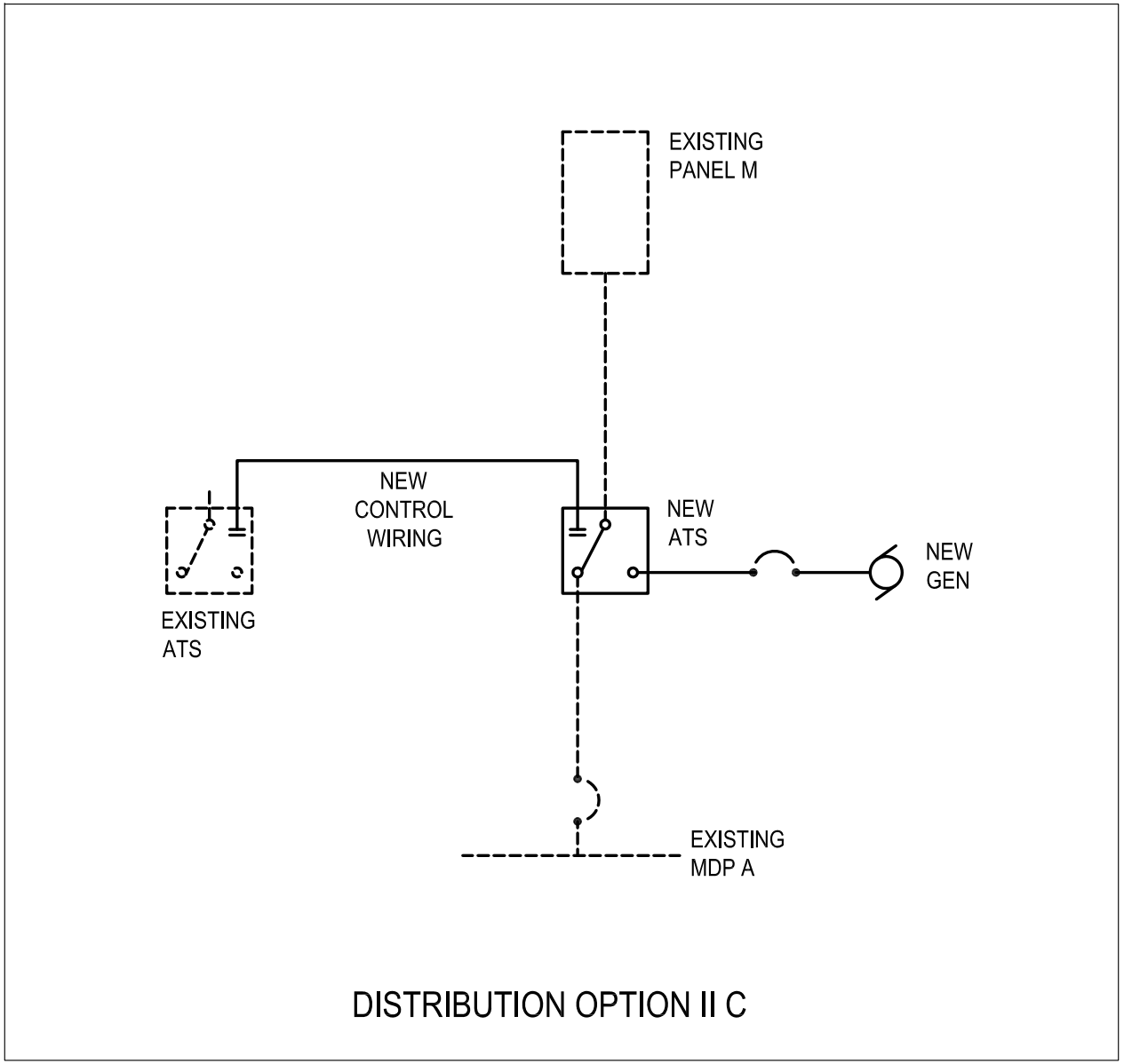

FIGURE 4