COMMERCIAL NEW CONSTRUCTION PROGRAM

Bundle Requirements Document

Camp Dodge Building S52 Renovation

Johnston, IA

December 10, 2019
4019415

Prepared for

MIDAMERICAN ENERGY COMPANY

877.939.1874
midamericanenergy.com

by

WILLDAN

877.938.1588
www.willdan.com

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Summary

This document details the selected energy conservation strategies, an approximate timeline for verification, and the submittal information that we will need to complete the process.

The estimated MidAmerican Energy Company incentive offer is **$21,716** for the implementation of the energy conservation measures, including the HVAC system, that comprise your energy efficiency bundle. To receive the full incentive, all strategies must be verified as functionally installed.

List of Selected Strategies

The following pages include a summary list of the selected strategies. Please review this list, taking note of the requested submittals. Also, please confirm the project timing and inform us if any of these strategies are no longer planned for implementation.

Space Asset Area	Strategy Description	Portion of Total $ Savings Modeled
HVAC 1	Barracks - Occupied, Barracks - Unoccupied: Variable Air Volume with Gas Boiler and DX; Office & Common Areas, Dining: Variable Air Volume with Gas Boiler and DX; Kitchen: Packaged Single Zone with Gas Boiler	-9%
	Mechanical	
Facility	VFD on building heating water pump	< 1%
Facility	95% efficient gas boiler with aggressive temperature reset	11%
Barracks VAV	5% improved DX cooling efficiency	3%
Barracks VAV	High efficiency DX compressor part load performance	22%
Barracks VAV	Demand control ventilation for Barracks - Occupied	1%
Barracks VAV	Occupancy sensor control of zone temperature for Barracks - Occupied	< 1%
Barracks VAV	Programmable thermostats for Barracks - Occupied	< 1%
Barracks VAV	Demand control ventilation for Barracks - Unoccupied	1%
Barracks VAV	Occupancy sensor control of zone temperature for Barracks - Unoccupied	< 1%
Barracks VAV	Programmable thermostats for Barracks - Unoccupied	< 1%
Common Areas VAV	5% improved DX cooling efficiency	2%
Common Areas VAV	High efficiency DX compressor part load performance	15%
Common Areas VAV	Demand control ventilation for Office & Common Areas	3%
Common Areas VAV	Occupancy sensor control of zone temperature for Office & Common Areas	< 1%
Common Areas VAV	Demand control ventilation for Dining	9%
Common Areas VAV	Occupancy sensor control of zone temperature for Dining	< 1%
	Electrical	
Barracks - Occupied	Vacancy sensor controls, 100% of space	1%
Barracks - Occupied	Lighting power in Barracks - Occupied reduced to 0.43 W/ft²	3%

Space Asset Area	Strategy Description	Portion of Total $ Savings Modeled
Barracks - Unoccupied	Vacancy sensor controls, 100% of space	1%
Barracks - Unoccupied	Lighting power in Barracks - Unoccupied reduced to 0.43 W/ft²	3%
Office & Common Areas	Occupancy sensor controls, 100% of space	< 1%
Office & Common Areas	Lighting power in Office & Common Areas reduced to 0.63 W/ft²	1%
Dining	Occupancy sensor controls, 100% of space	< 1%
Dining	Lighting power in Dining reduced to 0.63 W/ft²	1%
Kitchen	Vacancy sensor controls, 100% of space	< 1%
Kitchen	Lighting power in Kitchen reduced to 0.69 W/ft²	< 1%
	Service Water Heating	
Facility	95% SWH efficiency	6%
Barracks - Occupied	WaterSense showerheads	2%
Barracks - Unoccupied	WaterSense showerheads	2%
	Plug Load	
Barracks - Occupied	ENERGY STAR clothes washer	7%
Barracks - Unoccupied	ENERGY STAR clothes washer	7%
Total Savings		**100%**

Selected Strategies and Requirements

Mechanical Strategies

Mechanical

<table>
<tr><th>Space Asset Area</th><th>Strategy Description</th><th>Design Requirements</th></tr>
<tr><td>Facility</td><td>VFD on building heating water pump</td><td>Install VFD control rather than constant speed drives on the loop pump motors. This strategy assumes two-way valves on applicable hydronic system coils to reduce flow rate (modeled to minimum 30% flow) during periods of low load.</td></tr>
<tr><td>Facility</td><td>95% efficient gas boiler with aggressive temperature reset</td><td>Install a condensing gas boiler with 95% peak efficiency and specify an aggressive temperature reset schedule with return water temperatures ranging from 140°F (60°C) at peak winter conditions to 90°F (32.2°C) at mild conditions.</td></tr>
<tr><td>Barracks VAV</td><td>5% improved DX cooling efficiency</td><td>Improve cooling efficiency to values shown in the table below:
<table>
<tr><th>Size (tons)</th><th>Efficiencies (EER)</th></tr>
<tr><td>0 - 2.5</td><td>11.09</td></tr>
<tr><td>2.5 - 5.42</td><td>11.74</td></tr>
<tr><td>5.42 - 11.25</td><td>11.76</td></tr>
<tr><td>11.25 - 20</td><td>11.55</td></tr>
<tr><td>20 - 63.35</td><td>10.50</td></tr>
<tr><td>63.35 - 10000</td><td>10.19</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Space Asset Area</th><th>Strategy Description</th><th>Design Requirements</th></tr>
<tr><td>Barracks VAV</td><td>High efficiency DX compressor part load performance</td><td>Reduce the minimum compressor unloading ratio to 20%. Compressor cycling will be utilized below 20% loading. This is most effectively accomplished with a digital scroll compressor, but could be achieved with multiple staged compressors. Digital compressor controls generally result in part load efficiency (IEER) about 1-3 points higher than the full load efficiency (EER), e.g. 10 EER/13 IEER. Note: IEER ratings include fan energy. Variable volume fans can increase an IEER by about 2 points depending on the unit size. Pairing variable air volume with digital scroll compressor controls can result in part load efficiencies in the range of 12-15 IEER.</td></tr>
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</table>

Conditioning of Outside Air

Space Asset Area	Strategy Description	Design Requirements
Barracks VAV	Demand control ventilation for Barracks - Occupied	Use CO2 sensors, occupancy sensor control of zone ventilation, or other methodology to reduce the outside air during times of partial occupancy.
Barracks VAV	Occupancy sensor control of zone temperature for Barracks - Occupied	Allow the thermostat set points of spaces to float or reset the thermostat set points to unoccupied levels based on the occupancy for enclosed spaces such as classrooms and private offices.
Barracks VAV	Demand control ventilation for Barracks - Unoccupied	Use CO2 sensors, occupancy sensor control of zone ventilation, or other methodology to reduce the outside air during times of partial occupancy.
Barracks VAV	Occupancy sensor control of zone temperature for Barracks - Unoccupied	Allow the thermostat set points of spaces to float or reset the thermostat set points to unoccupied levels based on the occupancy for enclosed spaces such as classrooms and private offices.
Common Areas VAV	Demand control ventilation for Office & Common Areas	Use CO2 sensors, occupancy sensor control of zone ventilation, or other methodology to reduce the outside air during times of partial occupancy.
Common Areas VAV	Occupancy sensor control of zone temperature for Office & Common Areas	Allow the thermostat set points of spaces to float or reset the thermostat set points to unoccupied levels based on the occupancy for enclosed spaces such as classrooms and private offices.
Common Areas VAV	Demand control ventilation for Dining	Use CO2 sensors, occupancy sensor control of zone ventilation, or other methodology to reduce the outside air during times of partial occupancy.
Common Areas VAV	Occupancy sensor control of zone temperature for Dining	Allow the thermostat set points of spaces to float or reset the thermostat set points to unoccupied levels based on the occupancy for enclosed spaces such as classrooms and private offices.

Electrical Strategies

Lighting Controls

Space Asset Area	Strategy Description	Design Requirements
Barracks - Occupied	Vacancy sensor controls, 100% of space	Provide vacancy sensors in 100% of the applicable spaces throughout the Space Asset Area such that manual switches are used to turn lights on and the sensors automatically turn lights off when the space is unoccupied.
Barracks - Unoccupied	Vacancy sensor controls, 100% of space	Provide vacancy sensors in 100% of the applicable spaces throughout the Space Asset Area such that manual switches are used to turn lights on and the sensors automatically turn lights off when the space is unoccupied.
Office & Common Areas	Occupancy sensor controls, 100% of space	Provide occupancy sensors in 100% of the applicable spaces throughout the Space Asset Area. For classrooms, conference, meeting, and employee break rooms provide occupancy sensors and scene control.
Dining	Occupancy sensor controls, 100% of space	Provide occupancy sensors in 100% of the applicable spaces throughout the Space Asset Area. For classrooms, conference, meeting, and employee break rooms provide occupancy sensors and scene control.
Kitchen	Vacancy sensor controls, 100% of space	Provide vacancy sensors in 100% of the applicable spaces throughout the Space Asset Area such that manual switches are used to turn lights on and the sensors automatically turn lights off when the space is unoccupied.

Lighting Power Density

Space Asset Area	Strategy Description	Design Requirements
Barracks - Occupied	Lighting power in Barracks - Occupied reduced to 0.43 W/ft²	Reduce lighting power density by 30% below the Baseline specified by Space Asset Area allowances.

Space Asset Area	Strategy Description	Design Requirements
Barracks - Unoccupied	Lighting power in Barracks - Unoccupied reduced to 0.43 W/ft²	Reduce lighting power density by 30% below the Baseline specified by Space Asset Area allowances.
Office & Common Areas	Lighting power in Office & Common Areas reduced to 0.63 W/ft²	Reduce lighting power density by 30% below the Baseline specified by Space Asset Area allowances.
Dining	Lighting power in Dining reduced to 0.63 W/ft²	Reduce lighting power density by 30% below the Baseline specified by Space Asset Area allowances.
Kitchen	Lighting power in Kitchen reduced to 0.69 W/ft²	Reduce lighting power density by 30% below the Baseline specified by Space Asset Area allowances.

Other Strategies

Service Water Heating

Space Asset Area	Strategy Description	Design Requirements
Facility	95% SWH efficiency	Install an 95% efficient natural gas service hot water heater.
Barracks - Occupied	WaterSense showerheads	Install WaterSense showerheads with 2.0 gpm or less.
Barracks - Unoccupied	WaterSense showerheads	Install WaterSense showerheads with 2.0 gpm or less.

Plug Load

Space Asset Area	Strategy Description	Design Requirements
Barracks - Occupied	ENERGY STAR clothes washer	Provide ENERGY STAR rated clothes washers.
Barracks - Unoccupied	ENERGY STAR clothes washer	Provide ENERGY STAR rated clothes washers.

Multifamily

Space Asset Area	Strategy Description	Design Requirements
Barracks VAV	Programmable thermostats for Barracks - Occupied	Provide thermostats with the capability of programmed setbacks for temperature and fans.
Barracks VAV	Programmable thermostats for Barracks - Unoccupied	Provide thermostats with the capability of programmed setbacks for temperature and fans.

Required Submittals

One month prior to construction completion, please forward the following items in electronic format:

- Construction Documents and Specifications
- Construction submittals

Electrical

- The most current lighting plans with the accepted fixture schedule (if different from the Construction Documents)
- Lamp submittals showing the lamp type and input wattage
- Lighting control submittals

Mechanical

- All heating and cooling equipment submittals
- HVAC controls submittal
- Fan motor cut sheets showing operating bhp and cfm, use of EC motors
- Pump motor cut sheets showing operating bhp and gpm
- Sequence of operation showing occupancy sensor control of zone temperature and ventilation
- Service hot water equipment submittals
- Programmable thermostat submittals

Appliance

- Cutsheets showing the manufacturer, model, and quantity of ENERGY STAR® refrigerators, dishwashers, and clothes washers purchased for the project

Please submit these materials to WES.Drawings@willdan.com as compressed files via email using a commonly available compression technology. The program can receive email as large as 20 megabytes. If your documents exceed this size, please send them in multiple emails.

Measurement and Verification Plan

This Bundle Requirements Document is the first stage of the verification process and seeks to assure that the design intent bundle is implemented.

Willdan serves as a resource to verify that the accepted measures are installed. The process will be laid out in detail in the coming weeks, but it will generally include the following:

- One month before construction completion, the project team provides Construction Documents and Specifications (electronic format) to Willdan.
- When the building is completed and occupied, Willdan conducts field verification of the installed strategies.
- Willdan completes a draft Verification Report, as to status of strategy implementation, and circulates to the design team.
- MidAmerican Energy Company provides the incentive payment to the owner based on the final Verification Report.

The verification process is designed to assist the project team in knowing whether or not the strategies are installed as expected. If strategies are not found as expected, notification is given so corrections can be made. If some of the chosen strategies are not implemented within the design intent bundle, MidAmerican Energy Company will adjust the incentive amount.

Selected Bundle Results and Incentive

The Commercial New Construction program promotes the implementation of cost-effective bundles of strategies by proposing cash incentives to reduce the added cost of implementing the selected energy conserving strategies.

The incentive offers listed on the following pages make the presumption that the selected bundle will be implemented in its entirety. Any changes from the specifications of the selected bundle should be reported to Willdan. If it is deemed that these changes would have a significant impact on energy, then MidAmerican Energy Company will make adjustments to the incentives accordingly.

*** Please note that at this time the incentive is an estimate. The incentive will be confirmed upon verification and any subsequent strategy modifications.**

The simple payback analysis shows that the MidAmerican Energy Company incentive has helped reduce the incremental costs associated with the energy conservation strategy investments in this building, resulting in a payback of 12.9 years.

Energy Parameter	Baseline	Bundle 2
Building Results		
Energy Cost	$96,720	$72,646
Energy Cost Savings		$24,074
Percent Energy Cost Savings		25%
Electric Demand	212.4 kW	176.2 kW
Electric Demand Savings		36.2 kW
Percent Electric Demand Savings		17%
Electric Consumption	620,095 kWh	451,757 kWh
Electric Consumption Savings		168,338 kWh
Percent Electric Consumption Savings		27%
Gas Consumption	31,532 Therm	27,199 Therm
Gas Consumption Savings		4,334 Therm
Percent Gas Consumption Savings		14%
Gas Peak Day Savings		56 Therm
Percent Gas Peak Day Savings		14%
Total Results		
Electric Incremental First Cost		$83,654
Gas Incremental First Cost		$247,517
MidAmerican Energy Company Electric Incentive		$21,716
Estimated Total Incentive		**$21,716**
Simple Payback with Incentive		**12.9**

**Natural gas savings are not eligible for an incentive.*

***MidAmerican Energy Company's Commercial New Construction incentives cannot reduce the simple payback below one year, may not exceed 50% of the total bundled incremental strategy costs, and are capped at $200,000 per building.*

Energy Parameter	Baseline	Bundle 2
Building Results		
Energy Use Intensity (EUI)	115.2 KBtu/ft²/yr	93.2 KBtu/ft²/yr
EUI Savings		22.0 KBtu/ft²/yr
Percent EUI Savings		19%

***Note**: Subject to the following qualifications, the computer model offers sophisticated predictions of energy savings with estimations as good as any other means available for a building that has not been built.*

The strategy and bundle results compare relative differences in net energy use for design alternatives. The results are not appropriate for system design and/or equipment selection; these are responsibilities of the registered design professionals of record.

The actual energy use of this building will be different from simulated results. Building systems and other operating parameters provided by the design team and modeled by Willdan approximate actual conditions, but differences in weather, operating parameters, occupancy level, and changes that occur through the bidding and construction process will result in annual energy costs that will be different from what is predicted here. However, when a bundle of strategies is selected relative to other alternatives, its energy (and dollar) conserving value can be expected to remain constant relative to the other alternatives, and the magnitude of the cost should be approximately as predicted.

Thus, implementation of a bundle of strategies offers the opportunity for energy savings, but the realization of those savings is the responsibility of the owner/operator of the building – not MidAmerican Energy Company or Willdan. Savings are not guaranteed.

Appendix A. Project Information

Building Summary		
Location	Johnston, IA	
Narrative	Replacement of existing lighting and HVAC in barracks	
Space Asset Areas	Area	Number of Stories
Barracks - Occupied	12,200 ft²	2
Barracks - Unoccupied	12,200 ft²	2
Office & Common Areas	16,500 ft²	2
Dining	2,820 ft²	1
Kitchen	2,000 ft²	1
Total	**45,720 ft²**	**2**
Exterior lighting	N/A	
Utilities		
Electric Utility	MidAmerican Energy Company	
Gas Utility	MidAmerican Energy Company	
Schedule		
Construction Documents Complete		
Construction Start	04/24/2020	
Occupancy	12/17/2020	
Baseline Reference	Utility protocol baseline based on ASHRAE 90.1-2010 Appendix G	
Other Notes		

Systems Summary	
Selected HVAC	Barracks - Occupied, Barracks - Unoccupied: Variable Air Volume with Gas Boiler and DX; Office & Common Areas, Dining: Variable Air Volume with Gas Boiler and DX; Kitchen: Packaged Single Zone with Gas Boiler

Appendix B. Isolated Selected Strategy Results

The savings indicated is based on the performance of the individual strategy relative to the proposed HVAC system illustrating the impact of each strategy alone. The reported savings does not account for the interaction between multiple strategies, and as a result, the summation of the individual savings *may* not equal the total anticipated savings. The savings shown for the proposed HVAC system is in comparison to the baseline mechanical system.

Space Asset Area	Strategy Description	Peak kW Savings	kWh Savings	Gas Savings (Therm)	Energy Cost Savings	Inc. Cost Electric	Inc. Cost Gas
	HVAC Scenario A	-11.8	28,783	-5,627	-$2,156	$0	$216,446
Facility	VFD on building heating water pump	0	1,752	-29	$139	$549	$0
Facility	95% efficient gas boiler with aggressive temperature reset	0	-890	4,058	$2,856	$0	$7,132
Barracks VAV	5% improved DX cooling efficiency	3.3	4,360	0	$774	$4,575	$0
Barracks VAV	High efficiency DX compressor part load performance	11.2	34,233	0	$5,586	$15,860	$0
Barracks VAV	Demand control ventilation for Barracks - Occupied	1.3	848	239	$350	$2,465	$2,354
Barracks VAV	Occupancy sensor control of zone temperature for Barracks - Occupied	0.1	633	135	$197	$1,489	$1,415
Barracks VAV	Programmable thermostats for Barracks - Occupied	-0.9	354	216	$196	$527	$1,873
Barracks VAV	Demand control ventilation for Barracks - Unoccupied	1.3	848	239	$350	$2,465	$2,354
Barracks VAV	Occupancy sensor control of zone temperature for Barracks - Unoccupied	0.1	633	135	$197	$1,489	$1,415

Space Asset Area	Strategy Description	Peak kW Savings	kWh Savings	Gas Savings (Therm)	Energy Cost Savings	Inc. Cost Electric	Inc. Cost Gas
Barracks VAV	Programmable thermostats for Barracks - Unoccupied	-0.9	354	216	$196	$527	$1,873
Common Areas VAV	5% improved DX cooling efficiency	3.5	2,580	0	$518	$3,623	$0
Common Areas VAV	High efficiency DX compressor part load performance	10.1	20,970	0	$3,716	$12,558	$0
Common Areas VAV	Demand control ventilation for Office & Common Areas	0.7	627	739	$657	$1,250	$5,268
Common Areas VAV	Occupancy sensor control of zone temperature for Office & Common Areas	0.4	376	119	$157	$1,851	$2,076
Common Areas VAV	Demand control ventilation for Dining	2.3	2,507	2,465	$2,235	$230	$884
Common Areas VAV	Occupancy sensor control of zone temperature for Dining	0.3	619	85	$166	$429	$243
Barracks - Occupied	Vacancy sensor controls, 100% of space	0.8	3,530	-84	$322	$3,050	$0
Barracks - Occupied	Lighting power in Barracks - Occupied reduced to 0.43 W/ft²	2.5	7,056	-168	$643	$1,489	$0
Barracks - Unoccupied	Vacancy sensor controls, 100% of space	0.8	3,530	-84	$322	$3,050	$0
Barracks - Unoccupied	Lighting power in Barracks - Unoccupied reduced to 0.43 W/ft²	2.5	7,056	-168	$643	$1,489	$0
Office & Common Areas	Occupancy sensor controls, 100% of space	0.1	1,656	-33	$143	$2,888	$0
Office & Common Areas	Lighting power in Office & Common Areas reduced to 0.63 W/ft²	0.3	3,205	-69	$277	$2,013	$0

Space Asset Area	Strategy Description	Peak kW Savings	kWh Savings	Gas Savings (Therm)	Energy Cost Savings	Inc. Cost Electric	Inc. Cost Gas
Dining	Occupancy sensor controls, 100% of space	0.6	2,390	-63	$190	$705	$0
Dining	Lighting power in Dining reduced to 0.63 W/ft²	0.6	2,860	-71	$268	$344	$0
Kitchen	Vacancy sensor controls, 100% of space	0.3	1,891	-40	$159	$500	$0
Kitchen	Lighting power in Kitchen reduced to 0.69 W/ft²	0.3	2,269	-47	$213	$244	$0
Barracks - Occupied	ENERGY STAR clothes washer	3.7	19,688	-477	$1,780	$9,000	$0
Barracks - Unoccupied	ENERGY STAR clothes washer	3.7	19,688	-477	$1,780	$9,000	$0
Facility	95% SWH efficiency	0	0	2,036	$1,465	$0	$1,783
Barracks - Occupied	WaterSense showerheads	0	0	621	$446	$0	$1,200
Barracks - Unoccupied	WaterSense showerheads	0	0	621	$446	$0	$1,200

Appendix C. Project Participants

Name	Company	Email	Phone
Emir Kadic	IMEG Corp	emir.kadic@imegcorp.com	515-334-4317
Marty Kimball	IMEG Corp	Martin.A.Kimball@imegcorp.com	515-334-9906
Kristen Spina	IMEG Corp	Kristen.L.Spina@imegcorp.com	5156393041
Yaad Rahman	IMEG Corp.	yaad.k.rahman@imegcorp.com	309-788-0673
Michael Brothers	Iowa Army National Guard	michael.s.brothers.nfg@mail.mil	515-252-4225
Dale Kumbier	Iowa Army National Guard	dale.e.kumbier.nfg@mail.mil	515-252-4560
John Meredith	Iowa Army National Guard	john.k.meredith3.nfg@mail.mil	515.252.4568
Jim Rinell	Iowa Army National Guard	roland.j.rinell.nfg@mail.mil	515-250-5127
David Shea	Iowa Army National Guard	david.p.shea@mail.mil	515.250.6107
Ken Thornton	Iowa Department Of Public Defense	ken.o.thornton.nfg@mail.mil	515.727.3395
Mark Fitkin	MidAmerican Energy Company	MAFitkin@midamerican.com	515.252.6759
Erin Orth	MidAmerican Energy Company	EMOrth@midamerican.com	563-333-8038
Erin Rasmussen	MidAmerican Energy Company	ERasmussen@midamerican.com	563.333.8873
Bud (Robert) Renken	Willdan	rrenken@willdan.com	515.271.9917
Jacob Serfling	Willdan	jserfling@willdan.com	515.271.9912