

Rye School Buildings



A Comprehensive Energy-Evaluation Report

Dated: December 13, 2008

**Funded as
Part of:**
The GSE2 Program



Prepared for:

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Rye NH Schools Building Energy Assessment Report

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Introduction

The Jordan Institute (TJI) works to implement significant climate change solutions in New Hampshire by reducing energy use in buildings. Energy reduction is the fastest, most cost-effective strategy to reduce greenhouse gas emissions, as buildings represent 59% of all energy use in the state and 40% of all greenhouse gas emissions. Energy Efficiency Measures (EEMs) are available immediately, at reasonable cost, and yield tremendous gains in building performance. Furthermore, and more important to your bottom line, it helps control the operational costs of those buildings.

To address the available EEMs within your facility, TJI has established the Granite State Energy Efficiency Program (GSE2). One of the GSE2 objectives is to analyze and facilitate EEM projects within NH school buildings. As you know, we have been doing just that at two of your schools for the past two months or so. We have called in contractors who specialize in certain aspects of energy efficiency and in doing so, developed this comprehensive analysis of your buildings needs.

The findings and recommendations from our team of experts have been entered into energy modeling software and their estimated costs have been entered into financial modeling software. This report summarizes the results of that process.

Facility Description

The Rye Elementary School (RES) is a 50,467 square foot K-6 school located in Rye, NH, originally constructed in 1957. The building now consists of three distinct sections, with additions being added in 1965 and 1996.



The entire facility now serves 321 students and 61 staff members. This is a typical NH elementary school containing 33 classrooms, offices, kitchen, and a multi-purpose room that functions as a cafeteria and gymnasium. It is a single story structure built on a slab, except for a lower level boiler room.

The building is constructed with brick and block walls and a flat roof with varying roofing finishes; some rubber membrane and some ballasted. Its envelope insulation is believed to consist of approximately R-11 walls on the 1996 wing and R-3 on the others and R-20 roofs throughout.

Many entry doors are in need of sealing and weather stripping; however, the windows are thermal pane double hung units which allow minimal infiltration.

The mechanical systems delivering heat and fresh air to the space seems well maintained and up-to-date. Minor adjustments will improve comfort within the building, but the equipments efficiency appears adequate.

The building's energy performance is just above the national average according to an EPA evaluation. The site's Energy Use Index (EUI) is 67kBTU/SF, consisting of electricity, fuel oil and propane consumption. When calculating EUI for a greenhouse gas emissions figure, source EUI must be used, which is 113kBTU/SF. The buildings Cost Use Index is \$1.65/SF. This does not include the cost of water and sewer, however a high performance school should have a EUI between 45 and 65kBTU/SF and a CUI between \$0.85 and \$1.15/SF.

The Rye Middle School (RMS) is a 52,155 square foot junior high school located in Rye, NH, originally constructed in 1933. The building consists of four distinct areas due to additions in 1949, 1965, and 1996.

The building now serves 220 students and 39 staff members. This is a typical NH middle school containing 20 classrooms, offices, kitchen, cafeteria and gymnasium. It is a two story structure with a full basement.

The building is also constructed with solid brick or brick and block walls depending on the construction period; and a pitched shingled roof or flat roof, also depending on the construction period. Its envelope insulation is believed to consist of approximately R-3 at the solid brick walls, and R-11 walls on the newer wings. The roofs vary in insulation value with little to no insulation at the sloped roofs and R-20 rigid insulation covering the newer flat roofs.



Many entry doors are in need of sealing and weather stripping; however, the windows are thermal pane double hung units which allow minimal infiltration.

The mechanical systems delivering heat and fresh air to the space seems well maintained and up-to-date. Minor adjustments may improve comfort within the building, but the equipments efficiency appears adequate.

The building's energy performance is just above the national average according to an EPA evaluation. The site's Energy Use Index (EUI) is 68kBTU/SF, consisting of electricity, fuel oil and propane consumption. When calculating EUI for a greenhouse gas emissions figure, source EUI must be used, which is 104kBTU/SF. The buildings Cost Use Index is \$1.57/SF. This does not include the cost of water and sewer, however a high performance school should have a EUI between 50 and 75kBTU/SF and a CUI between \$0.95 and \$1.25/SF.

Suggested Energy Efficiency Measures

- ***Building Shell Issues***

The Rye Elementary School - On October 15th, 2008, The Jordan Institute conducted a blower-door test with infrared video imaging of the building shell at RES. This process was very revealing as to the tightness of the building.

The RES original building shell is solid brick and the newer wings are a brick and block construction. The infrared imaging indicated that the walls and windows are fairly tight. Any additional sealing of these components is unnecessary at this time. If a planned renovation at a later date allowed sealing minor voids in the thermal plane of the building that would be the cost effective approach.

The ceiling plane is an entirely different matter, however. The ceiling of the original building has a large amount of air leakage. This is evident as soon as you lift out a ceiling tile in the suspended ceiling. Moreover, the ceiling to wall connection does not create a continuous seal which seems to be the cause of a large portion of the air leakage; which is a typical issue in many buildings.



The insulation value of the ceiling and wall planes seem adequate; no apparent deficiencies detected. This combined with access problems suggests that only during a renovation or roof replacement should insulating the shell be warranted.

The Rye Middle School - On October 16th, 2008, The Jordan Institute conducted a blower-door test with infrared video imaging of the building shell at RMS. This process was similar to the steps taken at RES but revealed not-so-similar results

The imaging of the RMS building shell indicated that the walls and windows are tight. Any additional sealing of these components is unnecessary at this time. If a planned renovation at a later date allowed sealing minor voids in the thermal plane of the building that would be the cost effective approach. Furthermore, the ratio of heated space volume (CF) to exterior shell (SF) is greater at the Middle School.

The ceiling tightness of this building has issues similar to RES but additionally has multiple penetrations pertaining to the ventilation systems. The ceiling of the original building has the largest amount of air leakage. Again the ceiling to wall connection does not create a continuous seal. This attic plenum is vented (cold) making integrity of the HVAC distribution in the attic and the penetrations down into the heated space even more important. A visual inspection of these components discovered many paths for unwanted air flow.



Also evident is the poor connections between roof and wall. The photo to the right shows an example of an existing connection , in terms of thermal integrity.

The old gravity ventilation system has not been used in years but remains open. Air clearly travels up these shafts and into the unheated attic, virtually outside.

A copy of the study's findings is included within this report as Appendix C; however a summary of the findings is discussed below.

- ***Building Shell Solutions – Both Buildings***

AIR SEALING – Air sealing is the process of creating a continuous seal at a buildings perimeter in order to eliminate infiltration. This is a process which has a major impact on the heating load of a building. It is different than adding insulation and strictly

intended to stop the air flow through the building's shell. It addresses heat loss due to convection, where adding insulation addresses heat loss due to conduction.

The integrity of the walls' thermal plane is intact as demonstrated by the infrared imaging video (DVD) which we have included as part of this report. By viewing the video, you will see that very few breaches occur within the wall plane. These breaches are depicted by dark or black shades on the infrared image indicating a



colder temperature at the wall surface. The Jordan staff and its consultants have not observed any major infiltration in the wall surface and determined that air sealing at the walls is unjustified. That is not the case at the ceiling/roof portions of the shell.

The ceiling/roof portions of the shell are in great need of air sealing. Again, by watching the infrared imaging video, you can clearly see major breaches in this surface. The shots of the ceiling plane show multiple dark areas indicating air infiltration. This can be addressed by using closed cell spray foam at the eaves, wall-to-roof connection and various HVAC penetrations including the gravity system shafts. This will expand to a 1" +/- thickness, not intended for R-value but only to seal cracks and voids that allow air flow.

The apparatus that is used in the foam installation will allow installation with minimal impact to the interior space. As shown in the above picture, a hose brings in foam which will be sprayed at the leaky connections, eliminating infiltration as shown in the photo above.

Once this is complete, another infrared image will be used to verify that all infiltration has been sealed. If this commissioning procedure indicates the need for touch-up foaming, it will be done.



ADDING INSULATION – Wall insulation is intact as stated above; therefore no work is proposed within the walls.

The ceiling/roof insulation however, is clearly inadequate in certain spots. At the RES, a flat rubber membrane roof exists with varying amounts of rigid insulation under that membrane. There are issues like the old vent fan in room 100 that should be removed, sealed and insulated. Other than specific spots that may need insulation board, the roof insulation of the RES is sufficient and attempting to add more would not be an economically wise solution.

The main attic of the RMS consists mostly of cellulose insulation blown into the attic space. An evaluation of this blanket of insulation has shown an inconsistency of thicknesses, including bays that have little to no insulation at all. This is shown in the picture to the left. At the RMS, TJI proposes to add insulation value through the process of blowing in additional 6" - 8" of cellulose insulation on top of the existing layer. Our goal is to bring that plane up to an R-40 insulating value.

The library attic has little to no insulation or air barrier at the present time. TJI intends to install spray closed cell foam in the plane of the roof, that is to say, in the rafter bays. This will require an extra layer of foam (PFPI) that acts as the fire rating. Due to the fact that there is no structure, or ceiling finish available to create the thermal barrier at the horizontal plane, the insulation of the roof plane is the only viable solution.

Also, the venting now present in the roof will be sealed, creating a situation that leaves the attic as part of the conditioned space. This will require mechanical venting of the space in the summer months in order to vent heat and moisture. The specifics of that work are contained within the HVAC section of this report.

ENTRY DOOR WEATHER STRIPPING / SEALING – Air infiltration around existing door units must be addressed. The audit identified many units which allowed uninterrupted flow of cold air into the building. Specific door types will require unique solutions, but most will accept standard weather stripping components.

The following table illustrates a summary of the cost implication and resulting energy savings associated with the building shell upgrades:

| BUILDING SHELL UPGRADES - ENERGY MODELING RESULTS | | | | | |
|---|-----------|-----------|-------------------------------|-------------------|------------------------------------|
| MEASURE SUMMARY | | UNITS | THERMAL CONTENT (kBTUs) | PERCENT CHANGE | YEARS PAYBACK 2.2 |
| CAPITAL INVESTMENT COSTS | \$ 85,100 | | | | |
| ESTIMATED USEFUL LIFE | 30 YRS. | | | | |
| CURRENT ELECTRICITY USAGE (kWh) | 573,360 | 1,956,304 | 8% | | |
| RESULTING ELECTRICITY USAGE (kWh) | 485,292 | 1,655,816 | | | |
| CURRENT FUEL OIL USAGE (gal.) | 43,013 | 5,935,794 | 28% | | |
| RESULTING FUEL OIL USAGE (gal.) | 30,969 | 4,273,722 | | | |
| TOTAL ENERGY SAVINGS | | 1,962,560 | 23% | | |

• Heating System Issues

The Rye Elementary School - TJI has inspected the boilers at the Rye schools and found them to be of varying ages and manufacturers. RES has two existing hot water boilers which provide heat the building; a Peerless (1,861 mbh) and a Weil McLain (1,892 mbh). The boilers are not inter-connected, providing heat to independent areas of the building. The Peerless unit is older and should be replaced.

Water is distributed to the classrooms through a combination of fin tube radiation, cabinet heaters and in-duct coils.

The Rye Middle School - RMS has two Weil McLain steam boilers (1,708 & 1,584 mbh). Steam is delivered to the pre-1996 areas directly to radiators, unit heaters and fin tube radiation.

A steam to water heat exchanger provides primary heat to the 1996 areas and duct coils throughout the building.



- **Heating System Solutions**

The Rye Elementary School – The Peerless boiler will be replaced with two Ecopower combined heat and power (CHP) units. These units use a propane fired reciprocating engine to produce hot water. Waste heat from the engine is what heats the water which is then stored in a buffer tank to be distributed when thermostats call for heat.

The two units are sized to provide all the heat necessary in the shoulder months; with the second existing boiler to remain in place for use on peak days throughout the winter.

The engine however continuously produces electricity when it operates. The two units will be sized to provide 60% of the heating season electrical load or approximately 30% of the annual electrical requirements.



The Rye Middle School - The larger 1,708 Weil-McLain boiler will be replaced with an energy efficient unit and the smaller existing boiler will remain in place. Both units should be interconnected allowing redundancy which does not presently exist. At either school, no asbestos abatement is included.

The ducts providing fresh air and housing the heat coils should be sealed.

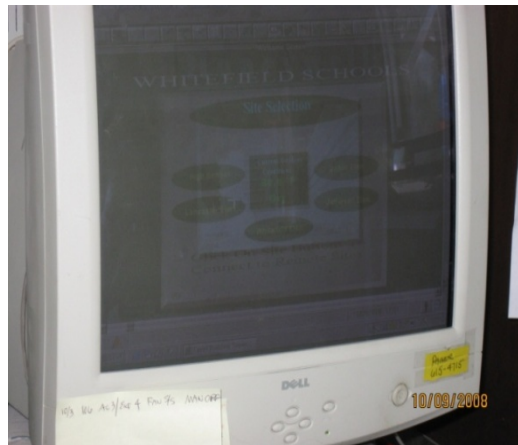
| HEATING SYSTEM - ENERGY MODELING RESULTS | | | | | |
|--|--|-------|-------------------------------|-------------------|---|
| MEASURE SUMMARY | | UNITS | THERMAL CONTENT (kBTUs) | PERCENT CHANGE | YEARS PAYBACK < |

- ***HVAC Control Issues***

TJI has inspected the HVAC controls at the Rye schools and found them to be a hybrid of components but consisting of predominately Viking Controls with various manufacturer's sensors or points.

The existing DDC system has various features or sequences that seem to control the HVAC system adequately. Not all rooms are equipped with thermostats that provide setback sequences to the DDC system.

This existing system monitors and controls the heating of the building but has a limited alarm sequence when the building is unoccupied. It does not have the capability to send out notification of problems to maintenance staff which may avoid more costly correction if discovered earlier. With minimal graphics, it does not allow the operator to visually monitor the operation through an interface with a designated personal computer.



- ***HVAC Control Solution***

The first step of in upgrading the existing DDC system will be to add thirty three (33) thermostats with occupied/unoccupied modes to seventeen (17) classrooms at RES and sixteen (16) at RMS.

A sensor on seven (7) supply/return fans; five (5) at RES and two (2) at RMS will allow status reports on these units. Also, each school should receive an alarm light outside the boiler rooms.

The existing controllers must be tied to a fully functioning front end computer with graphic images to allow maintenance staff to entirely monitor the hourly operation of the system. This upgrade will also allow the staff to access historical logs for analysis of trending features.

Furthermore this added front end will be added to the schools Ethernet networks allowing diagnostics of the system from a remote location with a personal computer tied to the internet.

HVAC CONTROLS - ENERGY MODELING RESULTS

| MEASURE SUMMARY | | UNITS | THERMAL CONTENT (kBtUs) | PERCENT CHANGE | YEARS PAYBACK 3.7 |
|-----------------------------------|-----------|-----------|-------------------------------|-------------------|------------------------------------|
| CAPITAL INVESTMENT COSTS | \$ 43,800 | | | | |
| ESTIMATED USEFUL LIFE | 15 YRS. | | | | |
| CURRENT ELECTRICITY USAGE (kWh) | 339,704 | 1,159,070 | 8% | | |
| RESULTING ELECTRICITY USAGE (kWh) | 312,528 | 1,066,346 | | | |
| CURRENT FUEL OIL USAGE (gal.) | 29,421 | 4,060,098 | 12% | | |
| RESULTING FUEL OIL USAGE (gal.) | 25,890 | 3,572,820 | | | |
| TOTAL ENERGY SAVINGS | | 580,002 | 11% | | |

• *Lighting Issues*

TJI has inspected the lighting quality of the both Rye schools included within this study. The lighting upgrade project undertaken a few years ago accomplished a very successful energy improvement over the antiquated T-12 lighting scheme that existed. The metal halide lights in the gymnasium still exist and very few occupancy sensors or daylight sensor were installed.

• *Lighting Solution*

RELAMP/REBALLAST - TJI has inspected the existing lighting inventory and determined that on many fixtures and upgrade to high-performance lamps and ballast would be appropriate. As you will see in the *Lighting Audit Fixture Report* contained in Appendix D, many of these procedures are a one-to-one switch out.

As you will also see in Appendix D, miscellaneous added fixture and sensors have also been designed into the scope of work at each school. As a summary, RES will receive 47 additional components and RMS will receive 3 more components.



LIGHTING CONTROLS - The additional reduction in electricity will be created by the use of occupancy sensors and daylight harvesting controls.

Our intention is to install approximately (104) occupancy sensors and (6) daylight sensors. A complete analysis of the lighting & lighting controls upgrade plan can be found within Appendix D.

| LIGHTING/ LIGHTING CONTROLS | | | | | |
|-----------------------------|--|-------|-------------------------------|-------------------|---|
| ENERGY MODELING RESULTS | | | | | |
| MEASURE SUMMARY | | UNITS | THERMAL CONTENT (kBTUs) | PERCENT CHANGE | YEARS PAYBACK < |

Recap of Energy Use Savings

The energy savings produced by the energy conservation measures listed within this report can be more easily understood if analyzed independently. The tables below analyze their effect on the current electrical load and fuel oil usage:

| <u>ELECTRICAL USAGE RESULTS</u> | |
|--|--------------------|
| EXISTING ANNUAL ELECTRICAL USE | 573,360 kWh |
| BUILDING SHELL REDUCTION | 88,068 |
| HEATING PLANT REDUCTION | 145,588 |
| HVAC CONTROLS REDUCTION | 27,176 |
| LIGHTING UPGRADES REDUCTION | 113,797 |
| PROJECTED ELECTRICAL UNIT SAVINGS | 374,629 kWh |
| RESULTING ELECTRICAL USE | 198,731 kWh |
| TOTAL ELECTRICAL SAVINGS | 68% |
| Note: Annual electrical usage is based upon FY2008 consumption figures. | |

| <u>FUEL OIL USAGE RESULTS</u> | |
|--|--------------------|
| EXISTING ANNUAL FUEL OIL USE | 43,013 gal. |
| BUILDING SHELL REDUCTION | 12,044 |
| HEATING PLANT REDUCTION | 1,548 |
| HVAC CONTROLS REDUCTION | 3,531 |
| LIGHTING UPGRADES REDUCTION | 0 |
| PROJECTED FUEL OIL UNIT SAVINGS | 17,123 gal. |
| RESULTING FUEL OIL USE | 25,890 gal. |
| TOTAL FUEL OIL SAVINGS | 40% |

Note: Annual fuel oil usage is based upon FY2008 consumption figures.

Recap of Energy Cost Savings

The energy cost savings produced by the energy conservation measures listed within this report can be more easily understood if analyzed independently. The tables below analyze their effect on the current electrical and fuel oil costs:

| <u>ELECTRICAL COST RESULTS</u> | |
|--|-----------------|
| EXISTING ELECTRICAL COST | \$95,262 |
| BUILDING SHELL REDUCTION | \$12,479 |
| HEATING PLANT REDUCTION | \$20,630 |
| HVAC CONTROLS REDUCTION | \$3,851 |
| LIGHTING UPGRADES REDUCTION | \$16,125 |
| PROJECTED ELECTRICAL COST SAVINGS | \$53,085 |
| RESULTING ELECTRICAL COST | \$42,177 |
| TOTAL ELECTRICAL SAVINGS | 44% |
| Note: Annual cost based upon 573,360 kWh @ 14.17¢ which is from the latest bill. The reduction in costs also uses these unit costs. | |

| <u>FUEL OIL COSTS RESULTS</u> | |
|--|-----------------|
| EXISTING FUEL OIL COST | \$94,629 |
| BUILDING SHELL REDUCTION | \$26,497 |
| HEATING PLANT REDUCTION (Additional propane calculated as fuel oil) | \$3,406 |
| HVAC CONTROLS REDUCTION | \$7,768 |
| LIGHTING UPGRADES REDUCTION | \$0 |
| PROJECTED FUEL OIL COST SAVINGS | \$37,671 |
| RESULTING FUEL OIL COST | \$56,958 |
| TOTAL FUEL OIL SAVINGS | 40% |
| Note: Annual cost based upon 43,013 gallons @ \$2.20 which is from the latest bill. The reduction in costs also uses this unit costs. | |

Summary of Financial Analysis

The energy cost savings shown in the previous section is to be considered a simple financial analysis. The process used above does not take into account energy rate inflation, borrowing costs & term, or expected return on investment. Therefore, The Jordan Institute has run a more comprehensive financial analysis using these factors. They are as follows:

| <u>TJI - FINANCIAL ANALYSIS CRITERIA</u> | |
|---|--------------------|
| TOTAL CAPITAL INVESTMENT | \$409,000 |
| ENERGY RATE INFLATION | 5% |
| BORROWING RATE | 7.5% |
| EXPECTED LOAN TERM | 10 Years |
| EXPECTED EQUIPMENT LIFESPAN | Varies |
| INFLATION ADJUSTED PAYBACK | 4.0 years |
| NET PRESENT VALUE | \$1,357,496 |
| EXPECTED INTERNAL RATE OF RETURN | 27.18% |

Clearly these factors can be adjusted depending upon Rye School District's financial plan for future years. As you will see in Appendix A, a change in these parameters will allow or discount additional upgrades that may be available.

Appendix A

GSE2 ENERGY MODELING REPORT

**Building Energy Model Report
Rye Elementary School
Rye, NH**

Prepared for:

The Jordan Institute

Prepared by:

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Vanderweil Project No.: 2481800

November 1, 2008

Draft

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Introduction

R. G. Vanderweil Engineers, LLP has been engaged by the Jordon Institute to develop a building energy model of the Rye Elementary School in Rye, NH. The objective of this project is to model building energy use and to use that model as the basis of savings calculations for potential energy conservation measures.

Executive Summary

This evaluation has been performed for the Jordan Institute and consists of an evaluation of the existing building systems and possible Energy Conservation Measures (ECMs) for the Rye Elementary School, Rye, NH.

The school consists of classrooms, office space, a computer server room, multi-purpose room and a kitchen. HVAC, envelope, lighting and DHW upgrades form the basis of this evaluation.

The following energy conservation measures were evaluated for energy savings:

- ◆ ECM#1 HVAC Controls
- ◆ ECM#2 Boiler Upgrade
- ◆ ECM#3 Lighting Time Clock
- ◆ ECM#4 Lighting Occupancy Sensors
- ◆ ECM#5 Multipurpose Room Lighting Upgrade
- ◆ ECM#6 Premium Efficiency Motors Upgrade
- ◆ ECM#7 Solar DHW

Estimated Annual Savings

| Measure | Electric kWh | Fuel Oil Gals | Cost |
|---------|-----------------|------------------|-----------|
| 1 | 45,663 | 3,999 | \$ 15,264 |
| 2 | - | 1,358 | \$ 2,986 |
| 3 | - | 236 | \$ 519 |
| 4 | 23,650 | (611) | \$ 2,008 |
| 5 | 10,146 | (242) | \$ 906 |
| 6 | 7,757 | (194) | \$ 673 |
| 7 | 4,063 | 19 | \$ 618 |

Energy savings for ECM#2, Boiler Upgrade, are conservative due to estimated boiler combustion efficiencies. A sensitivity on estimated boiler efficiency shows the annual oil cost savings to range from \$ 2,900/ year to \$ 12,000/ year.

Within this evaluation a base model was structured; this model forms the basis from which each ECMs' energy savings is determined. The base is modeled along with each of the ECMs using an energy simulation software program (eQuest). ECM energy savings are calculated by comparing the results of energy usage between the ECM and the base model. Descriptions of each ECM are described in this report.

Facility Description

The Rye Elementary School is a 50,467 square foot school originally built in 1957, with additions/renovations in 1965 and 1996. Occupancy is typically 300 students. The school consists of classrooms, offices, computer server, multipurpose room and a kitchen. The multipurpose room is used as a cafeteria and gymnasium. The school year typically starts at the end of August and runs to the middle of June.

Envelope

The building is of brick/block construction and is mostly a single story building, with a small lower level. The multipurpose room is the only area of the school that is two stories high. Wall and roof insulation is present in the 1996 addition, with estimated U-values of 0.09 for the wall and 0.05 for the roof. The pre-1996 portion of the school has been re-roofed and has 4-in of rigid insulation and has an estimated U-value of 0.05. The non-insulated walls of the pre-1996 portion of the school have an estimated U-value of 0.36. Windows are double pane double hung.

Heating, Ventilating, and Air Conditioning (HVAC)

The building is heated by two cast iron hot water boilers using No. #2 oil. The two boilers are not interconnected and only heat their respective areas. The older boiler is a Peerless 717FDA-WU, with a 1,861 mbh net rating, with a thermal efficiency of 81% at design conditions when newly installed. This boiler serves the older portion of the school built before 1996. This includes most of the front portion of the school, which is primarily classrooms. The newer boiler, installed with and servicing the 1996 addition, is a Weil-McLain 88-9. This boiler has a 1,892 mbh net output and a thermal efficiency rating of 83% at design conditions when new. The office area, which is not part of the 1996 addition, is serviced by this boiler. No boiler testing tags were observed on either boiler.

The heating water is circulated by four Bell & Gossett pumps. The two pumps serving the Peerless boilers are model 1522s, with 1/3 hp motors. The pumps are in a lead/lag setup (one pump operates and the second is back up). The remaining two pumps serving the Weil-McLain boiler are model 1531s, with 2 hp motors. The model 1531 pumps are specified to run at the same time. The water is distributed to fin tube radiation in classrooms, cabinet heaters and duct coils. The duct coils service rooftop units, which do not have heating coils.

Ventilation is provided by rooftop units. Units HRU-1 to HRU-5 are specified to provide 100% outside air to all classrooms and also recover heat from the exhaust to pre-heat the ventilation air. The units are manufactured by Des Champs. Trane unit HV-1 services the multi-purpose room and is specified to provide a minimum of 15% outside air to the room. HV-1 can supply up to 100% of outside air if the room temperature rises above the setpoint. This unit is de-energized when events such as plays are in progress, due to air noise from the diffusers. The exhaust fan portion of HV-1 is specified with a variable speed drive and is designed to energize when the supply fan is supplying more than 15% outside air. Two Trane rooftop units service the office (RTU-1) and library (RTU-2). The Trane units are specified to supply 15% of outside air. Roof exhaust fans service major restrooms. The kitchen has a supply fan specified to provide 50% unconditioned outside air to the main kitchen exhaust hood fan, with the remaining 50% being drawn from the multipurpose room.

Cooling is provided by Trane units RTU-1 and RTU-2. RTU-1 services the office area and RTU-2 services the library. RTU-1 has a specified cooling capacity of 3 tons, with RTU-2 having a specified capacity of 3.4 tons. The units have economizer sections which provide up to 100% outside air for free cooling when ambient temperatures are low enough. Compressor cooling will take over when ambient temperatures are too high for free cooling and the units will provide their preset minimum outside air quantities. Small split system AC units are provided for the computer server and media center areas. The server unit is a Mitsubishi unit with a rating of 1 ton. The media center unit is an EMI unit and is rated at 2.8 tons.

Thermostats are provided to control the heating and cooling systems. There is currently no automatic setback of temperatures or shutdown of units when the building is unoccupied. An existing Viking control system installed in 1996 to provide automatic building temperature control is not functional. Unit HV-1 has a ventilation over-ride timer next to the multi-purpose room thermostat to provide increased fresh air of up to a specified 40%, when needed.

Domestic Hot Water (DHW)

A Bock oil fired heater provides domestic hot water for the building. The heater has a storage capacity of 68 gallons and can produce hot water at 177 gal/hr for a water temperature rise of 90 deg F. The unit was placed in service during spring 2008. A small pump circulates the DHW throughout the building.

Electrical

The building has energy efficient fluorescent lighting for most areas. The fixtures utilize four foot T-8 lamps with electronic ballasts. Classrooms have three lamp fixtures with two ballasts and average 1.2 watts/sf. Hallways have two lamp fixtures and average 0.73 watts/sf. The multipurpose room has 400 watt metal halide lighting fixtures and has a lighting density of 1.31 watts/sf. There is no automatic control of lights and they are estimated to be energized during the school year from 7am to 11 pm when school is occupied.

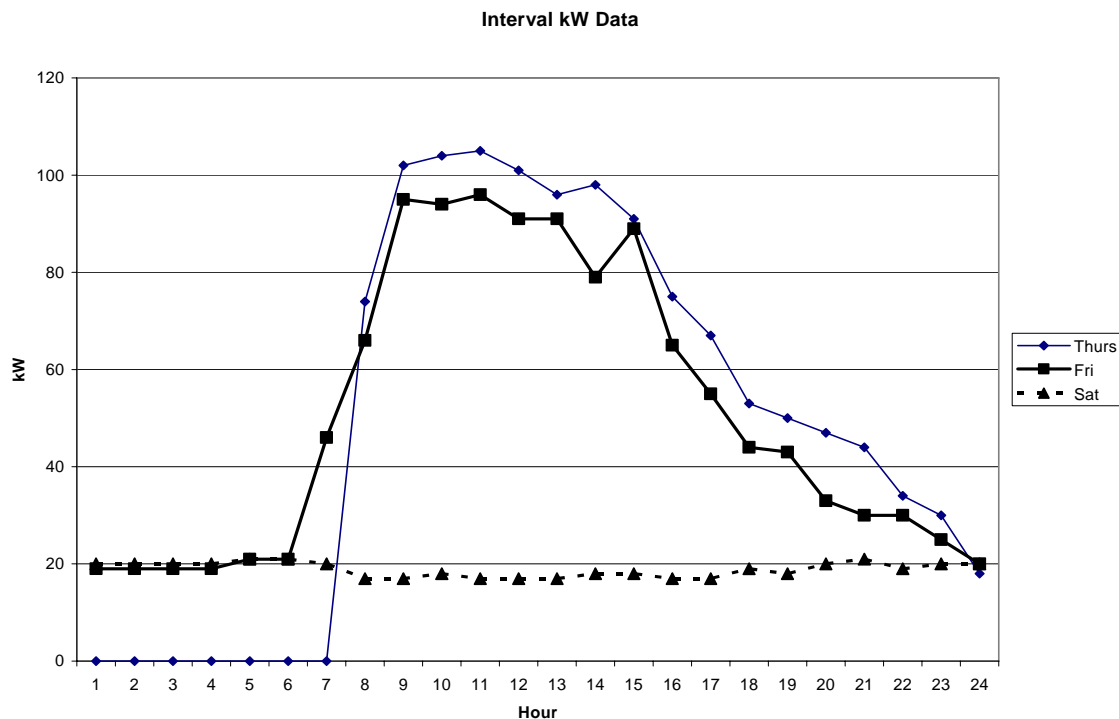
Energy Use

Electrical energy consumption totaled 333,920 kWh for the year from July 2007 to June 2008. No. 2 oil consumption totaled 18,767 gal for the same period. Propane usage was 527.2 gal. The following table summarizes energy consumption for the past three years.

| Energy | | July 2005 – June 2006 | July 2006 – June 2007 | July 2007 – June 2008 |
|-------------|------|-----------------------|-----------------------|-----------------------|
| Electricity | kWh | 321,680 | 304,880 | 333,920 |
| No. 2 Oil | gals | 18,668 | 19,925 | 18,767 |
| Propane | gals | 458.3 | 387.8 | 527.2 |

Electricity is purchased from Public Service of New Hampshire under service rate GV and including demand averaged \$0.1417/kWh for the 2007-2008 school year. Fuel oil costs for the same period averaged \$2.199/gal. Propane costs averaged \$3.37/gal for the 2007-2008 school year. Monthly summaries of the last three school years are summarized below.

Hourly interval kW/ kVA data was requested from Public Service of New Hampshire so that a daily profile of electrical use could be determined. This profile is shown in the graph below.



The data is representative of Thursday 5/8/08, Friday 5/9/08, and Saturday 5/10/08. Thursday's data is incomplete not 'zero' prior to 7 am. Observations that can be noted from this profile are listed below:

- Saturday's profile establishes a typical unoccupied day at 20 kW; it is unknown what the constant load actually consists of
- Electrical demand for occupied days tracks the unoccupied day prior to 7:00 am but does not at the days end. Note electrical loads don't reach the level of the unoccupied day until 11:00 pm.

Fuel oil is used for heating and domestic hot water, with heating accounting for 92% of oil consumption. Propane is used in the kitchen for cooking.

Energy Model

An energy model of the Rye Elementary School was developed using eQuest DOE2.2, an energy simulation software package especially designed to determine/ model building energy usage. The model was developed from a site visit, available drawings and specifications, and a meeting with school personnel. The building's physical characteristics (floor areas, walls, windows, roofs,...) were used to develop the model along with lighting systems, occupancy, miscellaneous equipment loads, mechanical systems (air handlers, fans, boilers, HVAC equipment), and domestic hot water systems. Operating schedules characterizing typical annual use of these equipments were developed from discussions with facility personnel and implemented in the model. Weather data for Portsmouth, NH was input into the model.

The energy model was tuned to approximate the latest annual accumulation of energy billing from utility bills but not necessarily the monthly totals. The baseline model is compared to the facility's energy usage in the following summary. Since oil usage is not coincident with oil delivery, some inaccuracy exists with the oil usage timing.

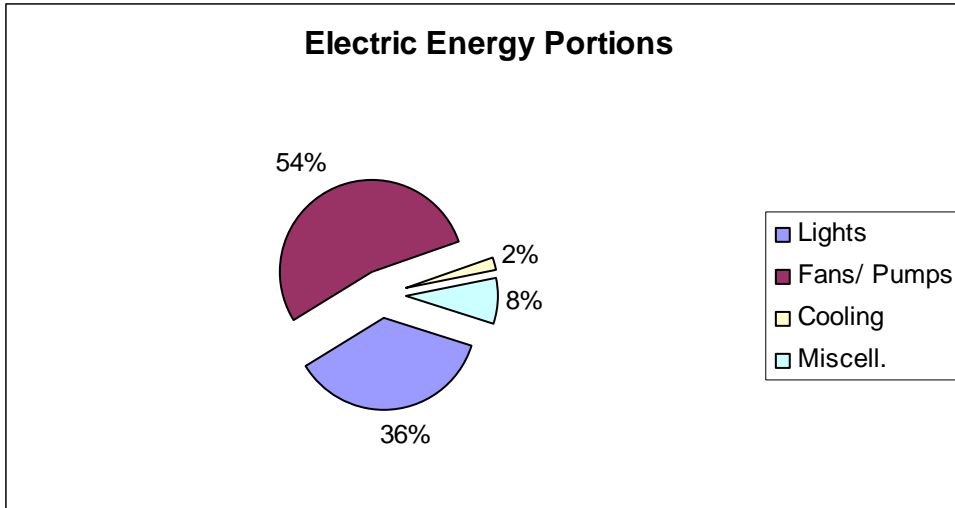
Energy Comparison

| | Actual Usage 2007/ 2008 | Energy Model Baseline |
|-----------------------------|----------------------------|-----------------------------|
| Annual Electric Usage (kWh) | 333,920 | 336,126 |
| Summer Demand – June kW | 112 | 109 |
| Winter Demand – Jan kW | 105 | 104 |
| Annual Oil Usage (gals) | 18,767 | 21,694 |

Electricity is used for lighting, computers, cooling, fans, pumps, office equipment and kitchen appliances. The following table indicates estimated percentage of electricity consumption based upon the energy model developed for the school.

Electrical Energy Summary

| | kWh | PerCent of Total |
|-------------|---------|---------------------|
| Lights | 121,743 | 36% |
| Fans/ Pumps | 179,872 | 54% |
| Cooling | 7,340 | 2% |
| Miscell. | 27,172 | 8% |
| Total | 336,127 | 100% |



The energy model forms the basis for evaluating energy conservation measures.

Energy Conservation Measures

Energy conservation measures were evaluated using the building energy model. The measures included HVAC, electrical, and DHW energy improvements. The following is a description of each energy conservation measure evaluated, along with estimated savings.

ECM #1 HVAC Controls

The school currently has no automatic setback of temperatures and no automatic shutdown of the rooftop units and exhaust fans. A Viking building automation system was installed in 1996 to provide central control of the HVAC system. This control system is not functional, leaving the HVAC systems to operate around the clock unless manually shut down. The installation of a functional building energy management system would allow the implementation of multiple control strategies to save electrical and heating energy. These include:

- Time clock scheduling and control of Rooftop units HRU-1 to HRU-5, HV-1, RTU-1, RTU-2 and exhaust fans during the unoccupied period to minimize fan energy as well as ventilation cooling/ heating energy.
- Temperature setback (65F) during unoccupied periods in classroom and other functional areas to save heating energy (Oil).

Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 45,663 | \$ 6,470 |
| Fuel Oil | gals | 3,999 | \$ 8,794 |
| Total | | | \$ 15,264 |

Electricity at \$.1417/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

ECM#2 Boiler Upgrade

The energy model calculates the school could be heated by just using one of the two existing boilers. There are two hot water heating loops for the school which are not interconnected. Connecting the two loops would allow the use of one boiler and allow a second to remain as backup. The two existing hot water boilers were considered efficient when they were newly installed. The older Peerless boiler had an efficiency of 81% when new and the newer Weil-McLain boiler had an efficiency of 83% when new. The existing boilers are estimated to have lost 1% in efficiency due to age and normal fouling of the heating exchanger. Newer boilers are more efficient, with improved burners, heat exchangers, and have more insulation. Replacing the older Peerless boiler with a higher efficiency boiler of 85.3% efficiency will reduce oil consumption. In that implementation the Weil-McLain would be used as backup for the new boiler. The two hot water piping systems would be tied together so that one boiler could heat the entire building. The estimated savings for this measure shown below are conservative since the existing boiler efficiencies are probably lower than those used in model. More accurate boiler combustion efficiencies which could only be obtained via on-site measurements are needed to better refine this savings estimates. The chart below estimates savings based on average boiler efficiency.

| Energy | | Energy Savings with estimated boiler efficiency. | Annual Cost Savings |
|-------------|------|--|---------------------|
| Electricity | kWh | 0 | 0 |
| Fuel Oil | gals | 1,358 | \$ 2,986 |
| Total | | | \$ 2,986 |

Electricity at \$.1417/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

| Boiler Efficiency | Oil Savings (gals) | Annual Cost Savings |
|-------------------|-----------------------|------------------------|
| As estimated | 1,358 | \$ 2,986 |
| 75% | 2,565 | \$ 5,640 |
| 70% | 4,168 | \$ 9,165 |
| 65% | 5,772 | \$ 12,693 |

ECM#2B Boiler Consolidation

Since the newest boiler appears to have the capacity to handle the school's heating load, an energy saving opportunity consisting of inter-connecting the two separate hot water loops and servicing both with only the newest boiler was evaluated. Like the previous boiler evaluation the savings summarized are conservative based on the noted boiler efficiencies.

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 0 | 0 |
| Fuel Oil | gals | 236 | \$ 519 |
| Total | | | \$ 519 |

Electricity at \$.1417/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

ECM#3 Lighting Time Clock

Lighting for the school is manually controlled. Estimated hours of operation are from 7am to 11pm five days a week. During vacation periods, the lighting may be left on until 4 pm for five days a week. Installing a time clock to deactivate lighting after the normal school day ends would reduce electrical energy consumption. Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 23,650 | \$ 3,351 |
| Fuel Oil | gals | (611) | \$ (1,344) |
| Total | | | \$ 2,008 |

Electricity at \$.1417/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

There is a penalty of 611 gal of oil due to the reduced heat gain from the lighting and is compensated by the heating system.

ECM#4 Lighting Occupancy Sensors

Lighting is left on continuously when the school is occupied. Occupancy is not always continuous. Installing occupancy sensors to deactivate lighting when the room is unoccupied after an adjustable time period would reduce electrical energy consumption. Studies have shown a 10% savings can be expected in a school environment by using occupancy sensors. The sensors

would have dual sensor technology to prevent lighting from turning off if the room is still occupied, as can happen with single sensor technology. An estimated 43 occupancy sensors would be installed. Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 10,146 | \$ 1,438 |
| Fuel Oil | gals | (242) | \$ (532) |
| Total | | | \$ 906 |

Electricity at \$.1417/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

There is a penalty of 242 gal of oil due to the reduced heat gain from the lighting and is compensated by the heating system.

ECM#5 Multipurpose Room Lighting Upgrade

The multipurpose room uses eighteen 400 watt metal halide lighting fixtures. Replacing the existing fixtures with eighteen fluorescent fixtures using four foot T5 lamps would reduce electrical energy consumption. The T5 fluorescent lamps maintain close to original their light level even near the end of their life, while metal halide light output is reduced to 60% when only 40% of their life has passed. The fluorescent lamps do not need a warm up time when first lit and provide better color rendering. Each fixture would have four T5 lamps for a total wattage of 238 watts, compared to 458 watts per fixture with the existing metal halide. Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 7,757 | \$ 1,099 |
| Fuel Oil | gals | (194) | \$ (427) |
| Total | | | \$ 673 |

Electricity at \$.1417/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

There is a penalty of 264 gal of oil due to the reduced heat gain from the lighting and is compensated by the heating system.

ECM#6 Premium Efficiency Motors Upgrade

Motors in the rooftop units and pumps are high efficiency motors. Changing motors to premium efficiency motors when a motor burns out will reduce electrical energy consumption. Only motors of 1 hp size and greater were evaluated. The following table presents the units suitable for motor upgrade

| Unit | Motor Hp |
|-------|----------|
| HRU-1 | 2(1.5) |
| HRU-2 | 2(5) |
| HRU-3 | 2(5) |
| HRU-4 | 2(1.5) |
| HRU-5 | 2(5) |
| RTU-2 | 1 |
| P-1 | 2 |
| P-2 | 2 |

Note: HV-1 was specified with two premium efficiency 5 hp motors and was not evaluated.

This implementation is only recommended when motors are replaced.

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 4,063 | \$ 576 |
| Fuel Oil | gals | 19 | \$ 42 |
| Total | | | \$ 539 |

Electricity at \$.1417/ kWh
 Fuel Oil (#2) at \$ 2.199/ gal

ECM#7 Solar DHW

Domestic hot water is provided by a No.2 oil fired heater with 68 gallons of storage capacity. Installing a solar heating DHW system would reduce oil consumption. The system would consist of roof mounted solar panels and piping between the collectors and a solar storage tank with a heating coil inside the tank. The solar panels would use a glycol/water mixture to prevent freeze ups and the mixture would be circulated by a pump. The solar storage tank would pre-heat the domestic water before it enters the existing oil fired heater, reducing oil consumption. Approximately 305 sq. ft. of collector would be required or 15 solar panels. Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | | |
| Fuel Oil | gals | 245 | \$ 539. |
| Total | | | \$ 539 |

Electricity at \$.1417/ kWh
 Fuel Oil (#2) at \$ 2.199/ gal

Energy Conservation Measures Not Evaluated

The following are energy conservation measures were considered but not evaluated.

Day-Lighting

The perimeter areas of classrooms has significant amounts of glazing and during the day receives a considerable amount of natural sunlight. These perimeter areas would be suited for a day-lighting control scheme. Photo sensors could be installed to modulate the light output depending on the amount of sunlight entering the space. As the amount of sunlight is increased in the space, the perimeter lights would dim to a predetermined light level set point. Lighting fixtures controlled by the photo sensors would require the removal of existing lamp ballasts and the installation of dimmable ballasts.

Condensing Boilers

Conventional boilers, both oil and natural gas, must operate at a minimum supply temperature of 130 to 140 deg F. Below those temperatures, the boiler exhaust gases will begin to condense. Normally, having a lower supply temperature will improve boiler efficiency, but conventional boilers are not designed for temperatures lower than previously stated. Continued operation at lower temperatures will lead to corrosion and possibly thermal shock problems for conventional boilers. Installing condensing boilers designed to take advantage of lower water supply temperatures during milder ambient temperatures will save heating energy. At present, the only condensing boilers available use natural gas. Small residential size condensing oil boilers are becoming available, but there are no commercial size condensing oil boilers currently available.

Methodology Limitations

In order to estimate energy consumption profiles, Vanderweil utilizes traditional computer based simulation programs such as Trane Trace®, DOE-2, and/or our own in-house calculations and/or programs based on industry standard methods. Vanderweil neither has control of nor assumes control of the actual building and equipment operation and climatic conditions. Accordingly, Vanderweil does not expressly or implicitly warrant or represent that Vanderweil's energy and associated cost estimates of the building or equipment operation will be the actual operation energy and cost.

R.G. Vanderweil Engineers, LLP's (Vanderweil) construction cost estimates are based upon traditional sources such as the Means Cost Estimating Guide, actual experience or an actual quotation. Due to the volatile nature of labor and material pricing and unforeseeable factors affecting the construction industry, Vanderweil does not expressly or implicitly warrant or represent that Vanderweil's cost estimates will be the actual cost of installation.

Appendix A Electrical Billing Summary (Three years)

| School Year | kW | kWh | Cost | Rate \$/ kWh |
|-------------|-------|------------|--------|--------------|
| Aug-05 | 72.8 | 19,760 \$ | 2,746 | |
| Sep-05 | 107.2 | 23,840 \$ | 3,480 | |
| Oct-05 | 111.2 | 30,000 \$ | 4,190 | |
| Nov-05 | 106.4 | 30,480 \$ | 4,173 | |
| Dec-05 | 107.2 | 30,880 \$ | 4,266 | |
| Jan-06 | 100 | 24,320 \$ | 3,499 | |
| Feb-06 | 100.8 | 27,920 \$ | 4,381 | |
| Mar-06 | 93.6 | 22,800 \$ | 3,715 | |
| Apr-06 | 107.2 | 32,160 \$ | 5,005 | |
| May-06 | 109.6 | 28,160 \$ | 4,522 | |
| Jun-06 | 108.8 | 30,880 \$ | 4,812 | |
| Jul-06 | 105.6 | 20,480 \$ | 2,907 | |
| | | 321,680 \$ | 47,696 | 0.148272 |
| Aug-06 | 70.4 | 17,680 \$ | 3,274 | |
| Sep-06 | 91.2 | 24,480 \$ | 3,225 | |
| Oct-06 | 97.6 | 27,440 \$ | 3,579 | |
| Nov-06 | 100 | 28,400 \$ | 3,732 | |
| Dec-06 | 100 | 27,600 \$ | 3,615 | |
| Jan-07 | 104.8 | 27,920 \$ | 3,757 | |
| Feb-07 | 105.6 | 29,440 \$ | 3,921 | |
| Mar-07 | 94 | 24,960 \$ | 3,502 | |
| Apr-07 | 93 | 26,320 \$ | 3,700 | |
| May-07 | 92 | 22,240 \$ | 3,183 | |
| Jun-07 | 103 | 28,960 \$ | 4,031 | |
| Jul-07 | 105 | 19,440 \$ | 3,014 | |
| | | 304,880 \$ | 42,533 | 0.139507 |
| Aug-07 | 61 | 16,560 \$ | 2,405 | |
| Sep-07 | 100 | 23,040 \$ | 3,378 | |
| Oct-07 | 112 | 30,400 \$ | 4,214 | |
| Nov-07 | 107 | 30,720 \$ | 4,223 | |
| Dec-07 | 110 | 31,600 \$ | 4,272 | |
| Jan-08 | 105 | 25,520 \$ | 3,763 | |
| Feb-08 | 108 | 32,080 \$ | 4,454 | |
| Mar-08 | 110 | 26,240 \$ | 3,861 | |
| Apr-08 | 110 | 32,960 \$ | 4,498 | |
| May-08 | 105 | 26,880 \$ | 3,892 | |
| Jun-08 | 112 | 33,840 \$ | 4,600 | |
| Jul-08 | 103 | 24,080 \$ | 3,764 | |
| | | 333,920 \$ | 47,324 | 0.141723 |

REPORT- ES-D Energy Cost Summary WEATHER FILE- PEASE INTL TRADEP NH

| UTILITY-RATE | RESOURCE | METERS | METERED ENERGY UNITS/YR | TOTAL CHARGE (\$) | VIRTUAL RATE (\$/UNIT) | RATE USED ALL YEAR? |
|------------------|-------------|--------|-------------------------------|-------------------------|------------------------------|------------------------|
| Electric Rate | ELECTRICITY | M-1 | 336126. KWH | 47629. | 0.1417 | YES |
| Natural Gas Rate | NATURAL-GAS | FM1 | 0. THERM | 0. | 0.0000 | YES |
| Oil Rate | FUEL-OIL | Oil | 21694. GAL | 47704. | 2.1990 | YES |
| | | | | ===== | | |
| | | | | 95333. | | |

ENERGY COST/GROSS BLDG AREA: 1.89
ENERGY COST/NET BLDG AREA: 1.89

REPORT- ES-E Summary of Utility-Rate: Electric Rate

WEATHER FILE- PEASE INTL TRADEP NH

3413. BTU/KWH

RESOURCE: ELECTRICITY DEMAND-INTERVAL 15
BILLING-DAY: 31 RATE-LIMITATION: 0.0000

METERS: M-1

POWER-FACTOR: 0.80 EXCESS-KVAR-FRAC: 0.75 EXCESS-KVAR-CHG: 0.0000

| RATE-QUALIFICATIONS | | | | BLOCK-CHARGES | | | | DEMAND-RATCHETS | | | | MIN-MON-RATCHETS | | | |
|---------------------|---------|---------|---------|---------------|---------|---------|---------|-----------------|--------|--------|--------|------------------|--------|--------|--------|
| MIN-ENERGY: | | | | MIN-ENERGY: | | | | MIN-ENERGY: | | | | MIN-ENERGY: | | | |
| MAX-ENERGY: | | | | MAX-ENERGY: | | | | MAX-ENERGY: | | | | MAX-ENERGY: | | | |
| MIN-DEMAND: | | | | MIN-DEMAND: | | | | MIN-DEMAND: | | | | MIN-DEMAND: | | | |
| MAX-DEMAND: | | | | MAX-DEMAND: | | | | MAX-DEMAND: | | | | MAX-DEMAND: | | | |
| QUALIFY-RATE: | | | | QUALIFY-RATE: | | | | QUALIFY-RATE: | | | | QUALIFY-RATE: | | | |
| USE-MIN-QUAL: | | | | USE-MIN-QUAL: | | | | USE-MIN-QUAL: | | | | USE-MIN-QUAL: | | | |
| ALL YEAR | | | | ALL YEAR | | | | ALL YEAR | | | | ALL YEAR | | | |
| NO | | | | NO | | | | NO | | | | NO | | | |
| METERED | BILLING | METERED | BILLING | METERED | BILLING | METERED | BILLING | ENERGY | CHARGE | DEMAND | ENERGY | CHARGE | DEMAND | ENERGY | CHARGE |
| ENERGY | ENERGY | ENERGY | ENERGY | ENERGY | ENERGY | ENERGY | ENERGY | CHARGE | CHARGE | CHARGE | CHARGE | CHARGE | CHARGE | CHARGE | CHARGE |
| KWH | KWH | KW | KW | KW | KW | KW | KW | (\$) | (\$) | (\$) | (\$) | (\$) | (\$) | (\$) | (\$) |
| MONTH | KWH | KWH | KW | KW | KW | KW | KW | (\$) | (\$) | (\$) | (\$) | (\$) | (\$) | (\$) | (\$) |
| JAN | 37428 | 37428 | 104.1 | 104.1 | 104.1 | 104.1 | 104.1 | 5304 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 5304 |
| FEB | 23386 | 23386 | 104.1 | 104.1 | 104.1 | 104.1 | 104.1 | 3314 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 3314 |
| MAR | 37297 | 37297 | 104.2 | 104.2 | 104.2 | 104.2 | 104.2 | 5285 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 5285 |
| APR | 32528 | 32528 | 106.9 | 106.9 | 106.9 | 106.9 | 106.9 | 4609 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 4609 |
| MAY | 36670 | 36670 | 107.8 | 107.8 | 107.8 | 107.8 | 107.8 | 5196 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 5196 |
| JUN | 18710 | 18710 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 2651 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 2651 |
| JUL | 2473 | 2473 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 350 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 350 |
| AUG | 8670 | 8670 | 107.6 | 107.6 | 107.6 | 107.6 | 107.6 | 1229 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 1229 |
| SEP | 36427 | 36427 | 107.4 | 107.4 | 107.4 | 107.4 | 107.4 | 5162 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 5162 |
| OCT | 38542 | 38542 | 107.1 | 107.1 | 107.1 | 107.1 | 107.1 | 5461 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 5461 |
| NOV | 32479 | 32479 | 104.2 | 104.2 | 104.2 | 104.2 | 104.2 | 4602 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 4602 |
| DEC | 31515 | 31515 | 104.3 | 104.3 | 104.3 | 104.3 | 104.3 | 4466 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 4466 |
| TOTAL | 336126 | 336126 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 47629 | 0 | 0 | 0 | 0 | 0 | 0.1417 | 47629 |

**Building Energy Model Report
Rye Jr High School
Rye, NH**

Prepared for:

The Jordan Institute

Prepared by:

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274 Summer Street, Boston, MA 02210

Vanderweil Project No.: 2481800

November 5, 2008

Draft

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Introduction

R. G. Vanderweil Engineers, LLP has been engaged by the Jordon Institute to develop a building energy model of the Rye Jr High School in Rye, NH. The objective of this project is to model building energy use and to use that model as the basis of savings calculations for potential energy conservation measures.

Executive Summary

This evaluation has been performed for the Jordan Institute and consists of an evaluation of the existing building systems and possible Energy Conservation Measures (ECMs) for the Rye Jr High School, Rye, NH.

The school consists of classrooms, office space, a computer server room, gymnasium and a kitchen. HVAC, envelope, lighting and DHW upgrades form the basis of this evaluation.

The following energy conservation measures were evaluated for energy savings:

- ◆ ECM#1 HVAC Controls
- ◆ ECM#2 Boiler Upgrade
- ◆ ECM#2B Boiler Consolidation
- ◆ ECM#4 Lighting Occupancy Sensors
- ◆ ECM#5 Multipurpose Room Lighting Upgrade
- ◆ ECM#6 Premium Efficiency Motors Upgrade
- ◆ ECM#7 Solar DHW

Estimated Annual Savings

| Measure | Electric kWh | Fuel Oil Gals | Cost |
|---------|-----------------|------------------|-----------|
| 1 | 7,206 | 4,239 | \$ 10,343 |
| 2 | - | 2,207 | \$ 4,853 |
| 2B | - | 510 | \$ 1,121 |
| 4 | 9,526 | (197) | \$ 917 |
| 5 | 6,134 | (134) | \$ 575 |
| 6 | 3,213 | (11) | \$ 431 |
| 7 | - | 493 | \$ 1,084 |

Measure #3 (Lighting Controls) was not evaluated.

Energy savings for ECM#2, Boiler Upgrade, are conservative due to estimated boiler combustion efficiencies. A sensitivity analysis of estimated boiler efficiency shows the annual oil cost savings to range from \$ 5,000/ year to \$ 14,000/ year.

Within this evaluation a base model was structured; this model forms the basis from which each ECMs' energy savings is determined. The base is modeled along with each of the ECMs using an energy simulation software program (eQuest DOE2.2). ECM energy savings are calculated by comparing the results of energy usage between the ECM and the base model. Descriptions of each ECM are described in this report.

Facility Description

The Rye Junior High School is a 52,155 square foot school originally built in 1933, with additions/ renovations in 1949, 1965 and 1996. Occupancy is typically 350 students. The school consists of classrooms, offices, computer server, cafeteria, gymnasium, and a kitchen. The school year typically starts at the end of August and runs to the middle of June.

Envelope

The building is of brick/block construction. The building is two stories high and has a basement. Wall insulation is present in the 1996 addition, with estimated U-values of 0.09 for the wall and 0.05 for the roof. The pitched roof section(pre-1996) has blown-in insulation, with an estimated U-value of 0.05. Windows are mostly double pane double hung type except for the gym, which is single pane. Due to the large size and weight of the double pane windows, there have been some problems with the window lift mechanisms.

Heating, Ventilating, and Air Conditioning (HVAC)

The building is heated by two cast iron steam water boilers using #2 fuel oil. The older boiler was installed in 1955 and is a Weil-McLain HR40-10, with a 1,708 mbh net rating and an estimated thermal efficiency of 80% when new. The newer boiler, installed in 1996, is a Weil-McLain 86-10, with a 1,584 mbh net output and a thermal efficiency rating of 81% when new. No boiler testing tags were observed on either boiler nor could operating efficiencies be obtained.

Steam is used for heating in most of the pre-1996 areas of the building. The system is two pipe steam, with steam traps at terminal heating units. The steam is distributed to radiators in classrooms and halls, unit ventilators in basement classrooms and the library, fin tube in the gymnasium and the gymnasium air handlers. A steam to water heat exchanger provides heating hot water for use primarily in the 1996 addition and for duct coils that service the classrooms in both older and 1996 areas. The heating water is circulated by two Bell & Gossett pumps. The pumps are in a lead/lag setup(one pump operates and the second is back up). The two pumps are Series 60, with 1.5 hp motors. The water is distributed to fin tube radiation in classrooms, unit ventilators in basement classrooms, cabinet heaters and duct coils. The duct coils service rooftop units, which do not have heating coils.

Ventilation is provided by rooftop units, air handlers, cabinet heaters and unit ventilators. Units HRU-1 and HRU-2 provide 100% outside air to all classrooms on the first and second floors and also recover heat from the exhaust to pre-heat the ventilation air. The units are manufactured by Des Champs. Two Trane rooftop units service the computer classrooms(RTU-1) and offices(RTU-3) and both are specified to deliver 15% outside air. A Magic Aire unit(RTU-2) services the cafeteria and is specified to provide 40% outside air, with up to 100% outside air when room temperature rises above the setpoint. Two indoor steam air handlers service the gymnasium and are specified to provide 15% outside air. Cabinet heaters and steam unit ventilators provide ventilation for the basement classrooms. They are specified to provide a minimum of 33% outside air and are capable of supplying up to 100% outside air when temperatures rise above the setpoint. Roof exhaust fans service major restrooms. The kitchen has a supply fan providing 50% unconditioned outside air to the main kitchen exhaust hood fan, with the remaining 50% being drawn from the cafeteria.

Cooling is provided by roof top units RTU-1 and RTU-3. RTU-1 has a specified cooling capacity of 3 tons, with RTU-3 having a specified capacity of 5 tons. The economizer sections of these units will provide free cooling by using up to 100% outside air for cooling. Compressor cooling will take over when ambient temperatures are too high for free cooling and the units will then supply their preset minimum outside air. RTU-2 only has economizer cooling. A small split system AC unit is provided for the computer server room. The unit is a Mitsubishi unit with a rated capacity of 1 ton.

Thermostats are provided to control the heating and cooling systems. There is currently no automatic setback of temperatures or automatic shutdown of units when the building is unoccupied. An existing Viking control system installed to provide automatic building control is not in service.

Domestic Hot Water (DHW)

A Bock oil fired unit provides domestic hot water for the building. The tank has a storage capacity of 68 gallons and a recovery rate of 177 gal/hr for a water temperature rise of 90 deg F. The unit was placed in service during spring 2008. A small pump circulates the DHW throughout the building.

Electrical

The building has energy efficient fluorescent lighting in most areas. The fixtures utilize four foot T-8 lamps with electronic ballasts. Classrooms have three lamp fixtures with two ballasts. Hallways have two lamp fixtures and one ballast. The gymnasium uses metal halide lighting. There is no automatic control of lights and they are typically energized during the school year from 7am to 11 pm.

Energy Use

Electrical energy consumption totaled 239,440 kWh for the year from July 2007 to June 2008. No. 2 oil consumption totaled 18,767 gal for the same period. Propane usage was 527.2 gal. The following table summarizes energy consumption for the past three years.

| Energy | July 2005 – June 2006 | July 2006 – June 2007 | July 2007 – June 2008 |
|-------------|-----------------------|-----------------------|-----------------------|
| Electricity | 251,360 kWh | 237,760 kWh | 239,440 kWh |
| No. 2 Oil | 21,914 gal | 21,489 gal | 24,246 gal |
| Propane | 458.3 gal | 387.8 gal | 527.2 gal |

Electricity is purchased from Public Service of New Hampshire under service rate G and including demand averaged \$0.1386/kWh for the 2007-2008 school year. Fuel oil costs for the same period averaged \$2.199/gal. Propane costs averaged \$3.43/gal for the 2007-2008 school year.

Hourly interval kW/ kVA data was requested from Public Service of New Hampshire so that a daily profile of electrical use could be determined. This data could not be obtained for the Jr. High School.

Fuel oil is used for heating and domestic hot water, with heating accounting for 92% of oil consumption. Propane is used in the kitchen for cooking.

Energy Model

An energy model of the Rye Jr. High School was developed using eQuest DOE2.2, an energy simulation software package especially designed to determine/ model building energy usage. The model was developed from a site visit, available drawings and specifications, and a meeting with school personnel. The building's physical characteristics (floor areas, walls, windows, roofs,...) were used to develop the model along with lighting systems, occupancy, miscellaneous equipment loads, mechanical systems (air handlers, fans, boilers, HVAC equipment), and domestic hot water systems. Operating schedules characterizing typical annual use of these equipments were developed from discussions with facility personnel and implemented in the model. Weather data for Portsmouth, NH was input into the model.

The energy model was tuned to approximate the latest annual accumulation of energy billing from utility bills but not necessarily the monthly totals. The baseline model is compared to the facility's energy usage in the following summary. Since oil usage is not coincident with oil delivery, some inaccuracy exists with the oil usage timing.

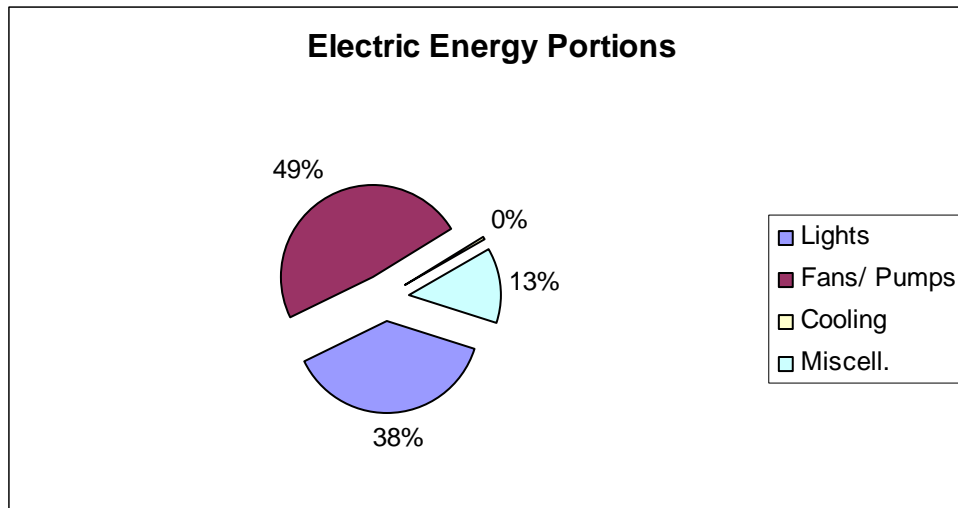
Energy Comparison

| | Actual Usage 2007/ 2008 | Energy Model Baseline |
|-----------------------------|----------------------------|-----------------------------|
| Annual Electric Usage (kWh) | 239,440 | 237,421 |
| Summer Demand – June kW | 80 | 93 |
| Winter Demand – Jan kW | 73 | 92 |
| Annual Oil Usage (gals) | 24,246 | 23,138 |

Electricity is used for lighting, computers, cooling, fans, pumps, office equipment and kitchen appliances. The following table indicates estimated percentage of electricity consumption based upon the energy model developed for the school.

Electrical Energy Summary

| | kWh | PerCent of Total |
|-------------|---------|---------------------|
| Lights | 89,138 | 38% |
| Fans/ Pumps | 113,497 | 48% |
| Cooling | 1,084 | 0% |
| Miscell. | 31,516 | 13% |
| Total | 235,235 | 100% |



The energy model forms the basis for evaluating energy conservation measures.

Energy Conservation Measures

Energy conservation measures were evaluated using the building energy model. The measures included HVAC, electrical, and DHW energy improvements. The following is a description of each energy conservation measure evaluated, along with estimated savings.

ECM #1 HVAC Controls

The school currently has no automatic setback of temperatures and no automatic shutdown of the rooftop units and exhaust fans. A Viking building automation system was installed in 1996 to provide central control of the HVAC system. This control system is not functional, leaving the HVAC systems to operate around the clock unless manually shut down. The installation of a functional building energy management system would allow the implementation of multiple control strategies to save electrical and heating energy. These include:

- Time clock scheduling and control of Rooftop units HRU-1 and HRU-2, RTU-1 to RTU-3, the gymnasium air handlers, and exhaust fans during the unoccupied period to minimize fan energy as well as ventilation cooling/ heating energy.
- Temperature setback (65F) during unoccupied periods in classroom and other functional areas to save heating energy (Oil).

Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 7,206 | \$ 1,021 |
| Fuel Oil | gals | 4,239 | \$ 9,322 |
| Total | | | \$ 10,343 |

Electricity at \$.1386 / kWh
Fuel Oil (#2) at \$ 2.199/ gal

ECM#2 Boiler Upgrade

The energy model calculates that school could be heated by using one of the two existing boilers. There are two heating loops for the school which are not interconnected. Connecting the two loops would allow the use of one boiler and allow a second to remain as backup. The two existing boilers were considered efficient when they were newly installed. The older Weil-McLain boiler had an efficiency of 80% when new and the newer Weil-McLain boiler had an efficiency of 83% when new. The existing boilers are estimated to have lost 2% to 3% in efficiency due to age and normal fouling of the heating exchanger. Newer boilers are more efficient, with improved burners, heat exchangers, and have more insulation. Replacing the older boiler with a higher efficiency boiler of 85.3% efficiency will reduce oil consumption. In that implementation the Weil-McLain would be used as backup for the new boiler. The piping systems would be tied together so that one boiler could heat the entire building. The estimated savings for this measure shown below are conservative since the existing boiler efficiencies are probably lower than those used in model. More accurate boiler combustion efficiencies which could only be obtained via on-site measurements are needed to better refine this savings estimates. The chart below estimates savings based on average boiler efficiency.

| Energy | | Energy Savings with estimated boiler efficiency. | Annual Cost Savings |
|-------------|------|--|---------------------|
| Electricity | kWh | | |
| Fuel Oil | gals | 2,207 | \$ 4,853 |
| Total | | | \$ 4,853 |

Electricity at \$.1386/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

| Boiler Efficiency | Oil Savings (gals) | Annual Cost Savings |
|-------------------|-----------------------|------------------------|
| As estimated | 2,207 | \$ 4,853 |
| 75% | 2,716 | \$ 5,972 |
| 70% | 4,414 | \$ 9,706 |
| 65% | 6,282 | \$ 13,814 |

ECM#2B Boiler Consolidation

Since the newest boiler appears to have the capacity to handle the school's heating load, an energy saving opportunity consisting of inter-connecting the two separate loops and servicing both with only the newest boiler was evaluated. Like the previous boiler evaluation the savings summarized are conservative based on the noted boiler efficiencies.

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | | |
| Fuel Oil | Gals | 510 | \$1,121 |
| Total | | | \$ 1,121 |

Electricity at \$.1386/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

ECM#3 Lighting Time Clock

Lighting for the school is manually controlled. Estimated hours of operation are from 7am to 11pm five days a week. During vacation periods, the lighting may be left on until 4 pm for five days a week. Installing a time clock to deactivate lighting after the normal school day ends would reduce electrical energy consumption. Unlike the Elementary School, hourly interval data could not be secured from Public Service of New Hampshire consequently an actual daily electrical profile could not be determined. This measure could not be evaluated for the Jr High School.

ECM#4 Lighting Occupancy Sensors

Lighting is left on continuously when the school is occupied. Occupancy is not always continuous. Installing occupancy sensors to deactivate lighting when the room is unoccupied after an adjustable time period would reduce electrical energy consumption. Studies have shown a 10% savings can be expected in a school environment by using occupancy sensors. The sensors would have dual sensor technology to prevent lighting from turning off if the room is still occupied, as can happen with single sensor technology. An estimated 34 occupancy sensors would be installed. Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 9,526 | \$ 1,350 |
| Fuel Oil | gals | (197) | \$ (433) |
| Total | | | \$ 917 |

Electricity at \$.1386/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

There is a penalty of 197 gal of oil due to the reduced heat gain from the lighting and is compensated by the heating system.

ECM#5 Gymnasium Lighting Upgrade

The gymnasium has eighteen metal halide lighting fixtures, which are assumed to use 400 watt metal halide lamps. Replacing the existing fixtures with eighteen fluorescent fixtures using four foot T5 lamps would reduce electrical energy consumption. The T5 fluorescent lamps maintain close to their original light level even near the end of their life, while metal halide light output is reduced to 60% when only 40% of their life has passed. The fluorescent lamps do not need a warm up time when first lit and provide better color rendering. Each fixture would have four T5 lamps for a total wattage of 238 watts (including ballast) per fixture, compared to 458 watts(including ballast) per fixture with the existing metal halide. Total electrical power draw is reduced from 8,244 watts to 4,284 watts, a savings of 3,960 watts. Estimated savings for this measure are as follows

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 6,134 | \$ 869 |
| Fuel Oil | Gals | (134) | \$ (295) |
| Total | | | \$ 575 |

Electricity at \$.1386/ kWh

Fuel Oil (#2) at \$ 2.199/ gal

There is a penalty of 134 gal of oil due to the reduced heat gain from the lighting and is compensated by the heating system.

ECM#6 Premium Efficiency Motors Upgrade

Motors in the rooftop units and pumps are high efficiency motors. Changing motors to premium efficiency motors when a motor burns out will reduce electrical energy consumption. Only motors of 1 hp size and greater were evaluated. The following table presents the units suitable for motor upgrade

| Unit | Motor Hp |
|-------|----------|
| HRU-1 | 2(5) |
| HRU-2 | 2(1.5) |
| RTU-2 | 2 |
| P-1 | 1.5 |
| P-2 | 1.5 |
| P-2 | 2 |

This implementation is only recommended when motors are replaced.

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | 3,213 | \$ 455 |
| Fuel Oil | Gals | (11) | \$ 24 |
| Total | | | \$ 431 |

Electricity at \$.1386/ kWh
Fuel Oil (#2) at \$ 2.199/ gal

ECM#7 Solar DHW

Domestic hot water is provided by a No.2 oil fired heater with 68 gallons of storage capacity. Installing a solar heating DHW system would reduce oil consumption. The system would consist of roof mounted solar panels and piping between the collectors and a solar storage tank with a heating coil inside the tank. The solar panels would use a glycol/water mixture to prevent freeze ups and the mixture would be circulated by a pump. The solar storage tank would pre-heat the domestic water before it enters the existing oil fired heater, reducing oil consumption by approximately 40%. Approximately 610 sq. ft. of collector would be required or 30 solar panels. Estimated savings for this measure are as follows:

| Energy | | Energy Savings | Annual Cost Savings |
|-------------|------|----------------|---------------------|
| Electricity | kWh | | |
| Fuel Oil | gals | 493 | \$ 1,084 |
| Total | | | \$ 1,084 |

Electricity at \$.1386/ kWh
Fuel Oil (#2) at \$ 2.199/ gal

Energy Conservation Measures Not Evaluated

The following are energy conservation measures were considered but not evaluated.

Day-Lighting

The perimeter areas of classrooms has significant amounts of glazing and during the day receives a considerable amount of natural sunlight. These perimeter areas would be suited for a day-lighting control scheme. Photo sensors could be installed to modulate the light output depending on the amount of sunlight entering the space. As the amount of sunlight is increased in the space, the perimeter lights would dim to a predetermined light level set point. Lighting fixtures controlled by the photo sensors would require the removal of existing lamp ballasts and the installation of dimmable ballasts.

Condensing Boilers

Condensing boilers are not applicable in this case as the boilers are steam. Steam from the boilers is produced at a minimum temperature of 212 deg F. Condensing boilers typically operate at a maximum of 180 deg F, and provide their best efficiency at temperatures below 130 deg F.

Methodology Limitations

In order to estimate energy consumption profiles, Vanderweil utilizes traditional computer based simulation programs such as Trane Trace®, DOE-2, and/or our own in-house calculations and/or programs based on industry standard methods. Vanderweil neither has control of nor assumes control of the actual building and equipment operation and climatic conditions. Accordingly, Vanderweil does not expressly or implicitly warrant or represent that Vanderweil's energy and associated cost estimates of the building or equipment operation will be the actual operation energy and cost.

R.G. Vanderweil Engineers, LLP's (Vanderweil) construction cost estimates are based upon traditional sources such as the Means Cost Estimating Guide, actual experience or an actual quotation. Due to the volatile nature of labor and material pricing and unforeseeable factors affecting the construction industry, Vanderweil does not expressly or implicitly warrant or represent that Vanderweil's cost estimates will be the actual cost of installation.

Appendix A Electrical Billing Summary (Three years)

School Year

| | kW | kWh | \$ | | |
|--------|------|---------|----------|-----|----------|
| Aug-05 | 55.2 | 15,360 | 2112.45 | | |
| Sep-05 | 87.2 | 19,440 | 2820.15 | | |
| Oct-05 | 89.6 | 22,400 | 3168.06 | | |
| Nov-05 | 83.2 | 22,080 | | | |
| Dec-05 | 82.4 | 24,160 | | | |
| Jan-06 | 83.2 | 21,200 | | | |
| Feb-06 | 84 | 23,840 | | | |
| Mar-06 | 81.6 | 20,960 | | | |
| Apr-06 | 80.8 | 23,840 | | | |
| May-06 | 79.2 | 20,160 | | | |
| Jun-06 | 85.6 | 22,240 | | | |
| Jul-06 | 80.8 | 15,680 | | | |
| | | 251,360 | | | |
| | | | | | |
| Aug-06 | 52.8 | 12,960 | | | |
| Sep-06 | 77.6 | 16,640 | | | |
| Oct-06 | 84 | 22,480 | | | |
| Nov-06 | 82.4 | 20,080 | | | |
| Dec-06 | 87.2 | 24,640 | | | |
| Jan-07 | 80 | 19,600 | | | |
| Feb-07 | 83.2 | 24,240 | | | |
| Mar-07 | 76 | 19,520 | | | |
| Apr-07 | 83.2 | 22,320 | | | |
| May-07 | 77.6 | 19,280 | | | |
| Jun-07 | 78.4 | 21,520 | | | |
| Jul-07 | 74.4 | 14,480 | | | |
| | | 237,760 | | | |
| | | | | | |
| Aug-07 | 44 | 14,000 | 1822.9 | | |
| Sep-07 | 80 | 18,480 | 2615.44 | | |
| Oct-07 | 82.4 | 22,400 | 3038.28 | | |
| Nov-07 | 76.8 | 20,080 | 2759.76 | | |
| Dec-07 | 77.6 | 20,720 | 2801.24 | | |
| Jan-08 | 73.6 | 19,840 | 2757.3 | | |
| Feb-08 | 75.2 | 23,040 | 3075.32 | | |
| Mar-08 | 81.6 | 19,840 | 2828.34 | | |
| Apr-08 | 80.8 | 23,040 | 3122.93 | | |
| May-08 | 77.6 | 19,520 | 2759.72 | | |
| Jun-08 | 82.4 | 22,400 | 3069.52 | | |
| Jul-08 | 80 | 16,080 | 2546.62 | | |
| | | 239,440 | 33197.37 | Avg | 0.138646 |

Appendix B BaseLine Energy Model

Project information

[See project database](#)

| | |
|-------------------------|-------------------------------------|
| Project name | Rye Elementary |
| Project location | Rye NH |
| Prepared for | Kevin Anderson |
| Prepared by | Clay Mitchell |
| Project type | Combined heating & power |
| Grid type | Central-grid |
| Analysis type | Method 1 |
| Heating value reference | Higher heating value (HHV) |
| Show settings | <input checked="" type="checkbox"/> |
| Language - Langue | English - Anglais |
| User manual | English - Anglais |
| Currency | \$ |
| Units | Imperial units |

Site reference conditions

[Select climate data location](#)

| | |
|-----------------------|-------------------------------------|
| Climate data location | Pease AFB/Portsmouth |
| Show data | <input checked="" type="checkbox"/> |

Latitude
Longitude
Elevation
Heating design temperature
Cooling design temperature
Earth temperature amplitude

| Unit | Climate data location | Project location |
|------|-----------------------|------------------|
| 'N | 43.1 | 43.1 |
| 'E | -70.8 | -70.8 |
| m | 31 | 31 |
| °C | -13.1 | |
| °C | 29.9 | |
| °C | 17.2 | |

| Month | Air temperature | Relative humidity | Daily solar radiation - horizontal | Atmospheric pressure | Wind speed | Earth temperature | Heating degree-days | Cooling degree-days |
|---------------|-----------------|-------------------|------------------------------------|----------------------|------------|-------------------|---------------------|---------------------|
| | °C | % | kWh/m²/d | kPa | m/s | °C | °C-d | °C-d |
| January | -3.6 | 64.7% | 1.62 | 99.9 | 3.7 | -4.3 | 670 | 0 |
| February | -2.0 | 61.7% | 2.46 | 99.9 | 3.8 | -3.4 | 560 | 0 |
| March | 1.9 | 62.3% | 3.41 | 99.9 | 3.9 | 0.5 | 499 | 0 |
| April | 7.6 | 63.2% | 4.34 | 99.7 | 3.7 | 5.8 | 312 | 0 |
| May | 13.3 | 68.4% | 5.10 | 99.8 | 3.2 | 11.7 | 146 | 102 |
| June | 18.5 | 70.8% | 5.56 | 99.7 | 2.9 | 16.9 | 0 | 255 |
| July | 21.6 | 72.6% | 5.55 | 99.7 | 2.6 | 19.8 | 0 | 360 |
| August | 20.8 | 74.5% | 5.00 | 99.9 | 2.6 | 19.3 | 0 | 335 |
| September | 16.4 | 74.8% | 3.84 | 100.1 | 2.7 | 15.5 | 48 | 192 |
| October | 10.6 | 70.3% | 2.66 | 100.1 | 3.1 | 9.5 | 229 | 19 |
| November | 5.4 | 67.9% | 1.69 | 100.0 | 3.5 | 4.2 | 378 | 0 |
| December | 0.0 | 66.1% | 1.40 | 99.9 | 3.7 | -1.1 | 558 | 0 |
| Annual | 9.3 | 68.1% | 3.56 | 99.9 | 3.3 | 7.9 | 3,400 | 1,263 |
| Measured at | m | | | | 10.0 | 0.0 | | |



[Complete Load & Network sheet](#)

RETScreen4 Beta 2007-09-19

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| Heating project | Unit | |
|--|---------------------------------|--------|
| Base case heating system | Single building - space heating | |
| Heated floor area for building | ft² | 50,000 |
| Fuel type | Diesel (#2 oil) - gal | |
| Seasonal efficiency | % | 80% |
| Heating load calculation | | |
| Heating load for building | Btu/ft² | 23.0 |
| Domestic hot water heating base demand | % | 3% |
| Total heating | million Btu | 2,432 |
| Total peak heating load | million Btu/h | 1.2 |
| Fuel consumption - annual | gal | 22,075 |
| Fuel rate | \$/gal | 2,750 |
| Fuel cost | \$ | 60,706 |
| Proposed case energy efficiency measures | | |
| End-use energy efficiency measures | % | 10% |
| Net peak heating load | million Btu/h | 1.0 |
| Net heating | million Btu | 2,189 |

RETScreen Load & Network Design - Combined heating & power project

| Power project | | Unit | |
|---|-----------------------------|-----------------------------|-------------------------|
| Base case power system | | Central-grid | |
| Grid type | | | |
| Base case load characteristics | | | |
| Month | Power gross average load kW | Power net average load kW | Heating average load kW |
| January | 35 | 35 | 214 |
| February | 35 | 35 | 171 |
| March | 37 | 37 | 124 |
| April | 37 | 37 | 74 |
| May | 38 | 38 | 34 |
| June | 37 | 37 | 2 |
| July | 38 | 38 | 2 |
| August | 40 | 40 | 2 |
| September | 41 | 41 | 12 |
| October | 38 | 38 | 52 |
| November | 36 | 36 | 92 |
| December | 37 | 37 | 151 |
| System peak electricity load over max monthly average | | 35.0% | |
| Peak load - annual | | 55 | 55 |
| Electricity | | MWh 330 | 330 |
| Electricity rate - base case | | \$/kWh 0.160 | 0.160 |
| Total electricity cost | | \$ 52,876 | \$ 52,876 |
| Base case system load characteristics graph | | | |
| | | | |
| Proposed case energy efficiency measures | | | |
| End-use energy efficiency measures | | % 3% | |
| Net peak electricity load | | kW 54 | |
| Net electricity | | MWh 321 | |
| Proposed case load and energy | | | |
| System peak load | | Power | Heating |
| System energy | | kW 54 | 1 |
| | | MWh 321 | million Btu/h 2,189 |
| | | | million Btu |
| Proposed case load characteristics | | | |
| Month | Power net average load kW | Heating net average load kW | |
| January | 34 | 192 | |
| February | 34 | 154 | |
| March | 36 | 112 | |
| April | 36 | 67 | |
| May | 37 | 30 | |
| June | 36 | 2 | |
| July | 37 | 2 | |
| August | 39 | 2 | |
| September | 40 | 11 | |
| October | 37 | 47 | |
| November | 35 | 83 | |
| December | 36 | 136 | |
| Peak load - annual | | 54 | 303 |
| Proposed case system load characteristics graph | | | |
| | | | |

| Proposed case power system | | | Incremental initial costs | | |
|---|-------------------------|--------|-------------------------------|------------------------------|--------------------------------------|
| System selection | | | Base load system | | |
| Base load power system | | | Reciprocating engine | | |
| Technology | | | | | 8,672 h |
| Availability | % | 99.0% | | | |
| Fuel selection method | | | Single fuel | | |
| Fuel type | | | Propane - gal | | |
| Fuel rate | \$/gal | 2.200 | | | |
| Reciprocating engine | | | | | |
| Power capacity | kW | 10 | 18.6% | \$ 83,000 | See product database |
| Minimum capacity | % | 20.0% | | | |
| Electricity delivered to load | MWh | 61 | 19.1% | | |
| Electricity exported to grid | MWh | 0 | | | |
| Manufacturer | Marathon Engine Systems | | | | |
| Model | ecopower x 2 | | | | |
| Heat rate | kJ/kWh | 15,072 | 1 unit(s) | | |
| Heat recovery efficiency | % | 86.5% | | | |
| Fuel required | million Btu/h | 0.1 | | | |
| Heating capacity | million Btu/h | 0.1 | 9.1% | | |
| Operating strategy - base load power system | | | | | |
| Fuel rate - base case heating system | \$/MWh | 85.18 | | | |
| Electricity rate - base case | \$/MWh | 160.00 | | | |
| Fuel rate - proposed case power system | \$/MWh | 78.74 | | | |
| Electricity export rate | \$/MWh | 160.00 | | | |
| Electricity rate - proposed case | \$/MWh | 160.00 | | | |
| | | | Electricity delivered to load | Electricity exported to grid | Remaining electricity required |
| | | | MWh | MWh | MWh |
| Operating strategy | | | | | Heat recovered |
| Full power capacity output | | | 87 | 0 | 234 |
| Power load following | | | 87 | 0 | 587 |
| Heating load following | | | 61 | 0 | 259 |
| | | | | | Remaining heat required |
| | | | | | million Btu |
| | | | | | Power system fuel |
| | | | | | million Btu |
| | | | | | Operating profit (loss) |
| | | | | | \$ |
| | | | | | Efficiency |
| | | | | | % |
| Select operating strategy | | | Heating load following | | |

| Proposed case system characteristics | Unit | Estimate | % | Incremental initial costs | System design graph | |
|--|---------------|------------------------|--------|---------------------------|---------------------|--|
| Power | | | | | | |
| Base load power system | | | | | | |
| Technology | | Reciprocating engine | | | | |
| Operating strategy | | Heating load following | | | | |
| Capacity | kW | 10 | 18.6% | | | |
| Electricity delivered to load | MWh | 61 | 19.1% | | | |
| Electricity exported to grid | MWh | 0 | | | | |
| Peak load power system | | | | | | |
| Technology | | Grid electricity | | | | |
| Suggested capacity | kW | 54 | | | | |
| Capacity | kW | 54 | 100.6% | | | |
| Electricity delivered to load | MWh | 259 | 80.9% | | | |
| Back-up power system (optional) | | | | | | |
| Technology | | | | | | |
| Capacity | kW | 0 | | | | |
| Heating | | | | | | |
| Base load heating system | | | | | | |
| Technology | | Reciprocating engine | | | | |
| Capacity | million Btu/h | 0.1 | 9.1% | | | |
| Heating delivered | million Btu | 574 | 26.2% | | | |
| Intermediate load heating system | | | | | | |
| Technology | | Not required | | | | |
| Peak load heating system | | | | | | |
| Technology | | Boiler | | | | |
| Fuel type | | Diesel (#2 oil) - gal | | | | |
| Fuel rate | \$/gal | 2.750 | | | | |
| Suggested capacity | million Btu/h | 1 | 115.9% | | | |
| Capacity | million Btu/h | 1 | 73.8% | | | |
| Heating delivered | million Btu | 1,614.2 | | | | |
| Manufacturer | | Existing | | | | |
| Model | | | | | | |
| Seasonal efficiency | % | 85% | | | | |
| Back-up heating system (optional) | | | | | | |
| Technology | | | | | | |
| Capacity | kW | | | | | |
| Proposed case system summary | | | | | | |
| | | Fuel type | | Fuel consumption - unit | Fuel consumption | |
| Power | | | | | | |
| Base load | | Propane | | gal | 9,151 | |
| Peak load | | Electricity | | MWh | 259 | |
| | | | | Total | 64 | |
| Heating | | | | | | |
| Base load | | Recovered heat | | | 28 | |
| Peak load | | Diesel (#2 oil) | | gal | 13,791 | |
| | | | | Total | 379 | |
| | | | | | 641 | |

| Emission Analysis | | | | | |
|---|-----------|--|------------------|------------------------------|------------------------------|
| Base case electricity system (Baseline) | | | | | |
| Country - region | Fuel type | GHG emission factor (excl. T&D) tCO2/MWh | T&D losses % | GHG emission factor tCO2/MWh | |
| United States of America | All types | 0.579 | | 0.579 | |
| GHG emission | | | | | |
| Base case | CO2 | 415.7 | | | |
| Proposed case | CO2 | 343.6 | | | |
| Gross annual GHG emission reduction | CO2 | 72.1 | | | |
| GHG credits transaction fee | % | | | | |
| Net annual GHG emission reduction | CO2 | 72.1 | is equivalent to | 14.7 | Cars & light trucks not used |
| GHG reduction income | | | | | |
| GHG reduction credit rate | \$/tCO2 | | | | |

| Financial Analysis | | | | | |
|---------------------------------|----|---------|--------|--|--|
| Financial parameters | | | | | |
| Inflation rate | % | 5.0% | | | |
| Project life | yr | 15 | | | |
| Debt ratio | % | 0% | | | |
| Initial costs | | | | | |
| Power system | \$ | 83,000 | 100.0% | | |
| Heating system | \$ | 0 | 0.0% | | |
| Other | \$ | | 0.0% | | |
| Total initial costs | \$ | 83,000 | 100.0% | | |
| Incentives and grants | | | | | |
| | \$ | | 0.0% | | |
| Annual costs and debt payments | | | | | |
| O&M (savings) costs | \$ | | | | |
| Fuel cost - proposed case | \$ | 99,577 | | | |
| Total annual costs | \$ | 99,577 | | | |
| Annual savings and income | | | | | |
| Fuel cost - base case | \$ | 113,582 | | | |
| Total annual savings and income | \$ | 113,582 | | | |
| Financial viability | | | | | |
| Pre-tax IRR - assets | % | 20.5% | | | |
| Simple payback | yr | 5.9 | | | |
| Equity payback | yr | 5.1 | | | |
| Cumulative cash flows graph | | | | | |
| | | | | | |

| | | |
|---|---|--|
| Settings | | |
| <input type="checkbox"/> As fired fuel | <input type="checkbox"/> Ground heat exchanger | <input type="checkbox"/> User-defined fuel - gas |
| <input type="checkbox"/> Biogas | <input type="checkbox"/> Heat rate | <input type="checkbox"/> User-defined fuel - solid |
| <input type="checkbox"/> Building envelope properties | <input type="checkbox"/> Heating value & fuel rate | <input type="checkbox"/> Water & steam |
| <input type="checkbox"/> Appliances & equipment | <input type="checkbox"/> Hydro formula costing method | <input type="checkbox"/> Water pumping |
| <input type="checkbox"/> Electricity rate - monthly | <input type="checkbox"/> Landfill gas | <input type="checkbox"/> Window properties |
| <input type="checkbox"/> Electricity rate - time of use | <input type="checkbox"/> Unit conversion | <input type="checkbox"/> Custom 1 |
| <input type="checkbox"/> GHG equivalence | <input type="checkbox"/> User-defined fuel | <input type="checkbox"/> Custom 2 |

Appendix B

GSE2 FINACIAL MODELING REPORT

Rye Schools Report

ASSUMPTIONS:

| | |
|------------------------|---------|
| Base Fuel Cost | \$2.20 |
| Base Electric Cost | \$0.147 |
| Energy Inflation Rate | 5.0% |
| General Inflation Rate | 3.0% |
| Borrowing Cost | 5.0% |
| Loan Yrs | 10.0 |

RESULTS:

| | |
|----------------------------|-------------|
| Cost to Implement | \$409,000 |
| Fuel/Electric Current Cost | \$178,913 |
| Usage Savings | 51.8% |
| \$ Savings | \$92,741 |
| Annual Loan Payment | \$52,057 |
| IRR | 27.18% |
| NPV | \$1,357,496 |
| Pay Back (1st yr) | 4.4 |
| Infl Adj'd Pay Back | 4.0 |
| Useful life (Wt'd ave) | 20.1 |

IN 10 YEARS:

| | |
|---|-----------|
| Annual Fuel Cost in 10 yrs if no action | \$666,218 |
| Annual Savings in 10 yrs | \$151,065 |
| Annual Fuel Cost in 10 yrs | \$515,152 |

| | | | |
|-------------|----------|----|------|
| Assumptions | Electric | \$ | 0.15 |
| | Oil | \$ | 2.20 |

Proposed Improvements

| | Improvement Cost | Current KW usage | New KW usage | Per cent Savings | Dollar Savings | Current Oil Usage | New Oil Usage | Savings | Dollar Savings |
|-------------------------|---------------------|---------------------|-----------------|---------------------|-------------------|----------------------|------------------|--------------|-------------------|
| Building Shell Upgrade: | \$ 85,100 | 573,360 | 485,292 | 15% | \$ 12,946 | 43,013 | 30,969 | 28% | \$ 26,497 |
| Ecopower Upgrades | \$ 166,500 | 485,292 | 339,704 | 30% | \$ 21,401 | 30,969 | 29,421 | 5% | \$ 3,406 |
| HVAC Controls | \$ 43,800 | 339,704 | 312,528 | 8% | \$ 3,995 | 29,421 | 25,890 | 12% | \$ 7,768 |
| Lighting Upgrades | \$ 113,600 | 312,528 | 198,731 | 36.4% | \$ 16,728 | 25,890 | 25,890 | 0% | \$ - |
| Total Cost | \$ 409,000 | 573,360 | 198,731 | 65.3% | \$ 55,070 | 43,013 | 25,890 | 39.8% | \$ 37,671 |

| | | | | |
|---------------------|----------------|------------|----------------|------------|
| Current Energy Cost | Current | New | Current | New |
| | \$ 84,284 | \$ 29,213 | \$ 94,629 | \$ 56,958 |
| | \$ 0.147 | | \$ 2.20 | |

Savings 65%

| Total Savings | 1st year Pay back | Useful life | Weighted useful life |
|------------------|-------------------|-------------|----------------------|
| \$ 39,443 | 2.2 | 30 | 6.2420538 |
| \$ 24,807 | 6.7 | 30 | 12.212714 |
| \$ 11,763 | 3.7 | 15 | 1.606357 |
| \$ 16,728 | 6.8 | 7 | 1.9442543 |
| \$ 92,741 | 4.4 | | 20.1 |

\$ 178,913

40% 51.8%

Appendix C

BUILDING SHELL ASSESSMENT REPORT

Building Envelope Solutions, Inc.
Building Inspections
Providing solutions for high-performance thermal envelopes

Rye Jr. High School, Rye, NH

October 16, 2008

To: Lucy Neiman, Jordan Institute
From: Jon Haehnel, Building Envelope Solutions, Inc.

RE: October 16th Scan and Blower Door Test at Rye Jr. High School

Thank you for allowing Building Envelope Solutions, Inc. to help with your building envelope needs. The following report presents our findings and recommendations from our diagnostic visit. This report summarizes my findings from the infrared images and highlights the locations of significant heat loss.

Reported concerns: Seeking opportunities to improve energy efficiency.

Ambient conditions 10-16-08:

Outside temperature: 62 °F

Inside temperature: 72 °F

Wind conditions: Calm and Rainy

Time of day: 2:20 pm – 9:40 pm

Blower door test notes:

1. Tested whole building with 4 fans, 2 at the main entrance and 2 at the back entrance between rooms 118 and 119.
2. 2 Doors to furnace room closed and sealed because of the large air intake.
3. All air handlers (that we know of) were off.
4. The furnace was off.
5. Doors to storage under gym closed (not actively heated).
6. Elevator system ventilation was on.
7. All interior doors open.
8. All exterior doors and windows closed and latched.

Blower Door Test Results:

1. The whole building leakage rate was 0.94 cubic feet per minute (CFM) at 50 Pascals of pressure (1.04 lbs./sq. ft) per unit area of exterior above grade shell. Most buildings in the United States are tested at the same level of pressure (50 Pascals) as a means of comparison. We were not able to achieve a 50 Pascal pressure difference because of the leakiness of the shell but extrapolated the CFM at 50 Pascals from the reading we obtained at 24 Pascals.

| CFM @ 24 Pascals | Temperature adjusted CFM @ 50Pa. | Cubic feet of Building Volume | Air changes per hour @ 50Pa. | Square Feet of Building Shell | CFM50/sf of shell |
|------------------|----------------------------------|-------------------------------|------------------------------|-------------------------------|-------------------|
| 21,770 | 37,099 | 586,830 | 3.79 | 39,584 | 0.94 |

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Rye Jr. High School, Rye, NH

- The table below shows how the Rye Jr. High School building compares to other commercial construction.

| | CFM50/sf of shell |
|--|-------------------|
| Rye Jr. High School | 0.94 |
| Local Museum constructed pre 1900. | 2.04 |
| US National Average for Commercial Buildings | 0.93 |
| Local High school (constructed 1958) | 1.29 |
| Typical Modern Construction | 0.60 to 0.90 |
| Local High Performance Building (major renovation to an art gallery) | 0.22 |
| Local High Performance Building (major renovation to a high school) | 0.17 |
| Local High Performance Building (new construction, middle school) | 0.19 |
| Local High Performance Building (major renovation, student center) | 0.23 |
| Local High Performance Building (new construction, student center) | 0.31 |

Notes for Understanding the Report:

- When viewing thermographs, lighter shades indicate higher surface temperatures than darker shades. What is considered “heat loss” is dependant upon the perspective from which it is viewed.
- Depressurization causes all outdoor air to flow inward and is not the normal operating state of the building. It is done to reveal conditions that would not normally be detected by the infrared camera or to enhance thermographic images. Depressurization is also used to mimic the environment a building would be under in conditions of high wind or very cold temperatures. The building was depressurized to about -24 Pascals during that part of the imaging.
- A copy of all the infrared images is included with the enclosed DVD.

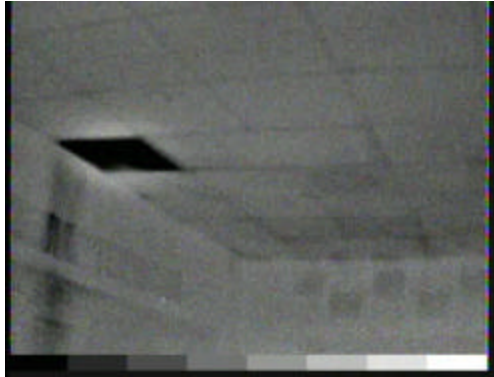
Findings and Recommendations :

- The old gravity activated ventilation system inside the interior walls cooled the interior walls while under depressurization. Under normal conditions warm air migrates though these shafts into the attics. Given that there is a mechanical ventilation system for the building now, this old ventilation system needs to be closed and sealed off with either caulk or spray foam depending on the access to each opening.
- The Jr. High School has a volume to surface area ratio of 14 c.f./s.f., as opposed to the Elementary school which is 10 c.f./s.f. This means that there is more exterior shell exposure per cubic foot of heated space at the Elementary School than at the Jr. High. This is an efficiency advantage that comes from having a relatively compact 3 story structure verses a single story structure with isolated wings. This probably explains why the 2 schools use roughly the same amount of heating oil even though the Jr. High has a much higher air leakage rate.

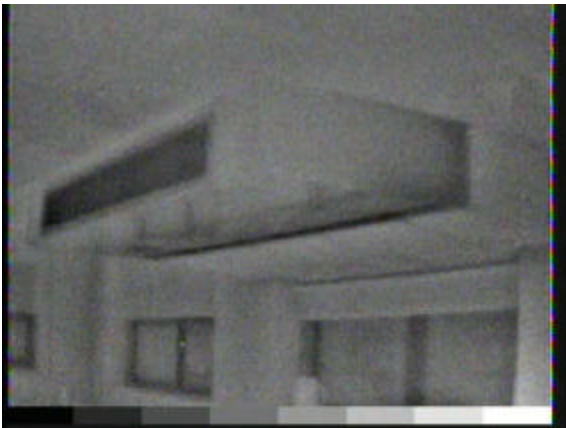
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Rye Jr. High School, Rye, NH

3. The mechanical ventilation system for the classrooms in the main building, much of which is up in the attic, is not particularly efficient. My scan revealed that the ventilation system is very well connected to the outdoors even when it is off. Visual inspection of the system from inside the attic confirms this, there are many visible gaps in the ductwork that connect the ducts to the attic space. Ventilation air should be drawn directly from the outside with a system of sealed ductwork so the flow of air can be monitored and controlled. This system needs a comprehensive review by a HVAC engineer to see if it can be designed to run more efficiently, ideally with heat recovery ventilators to maintain air flow while reducing heat loss and with sealed duct runs.
4. The AC opening in classroom 203 needs to be checked (see below), it got really cold when I depressurized. From these findings I assume that it has a direct connection to the outdoors with no damper. In the dead of winter, when AC is not required, this opening loses a lot of conditioned air to the outside. At a minimum a mechanically actuated damper should be installed to close off this opening for the winter. If the duct runs into a vented attic, it may need to be insulated and air sealed as well.



5. The life skills unit ventilator needs to be repaired (below left). Compared to the unit ventilator in the shop (below right) The damper leaks far too much and the heater has to work extra hard to overcome the cold air entering through that unit. One of the custodians that works at the Jr. High said that HVAC technicians have made several attempts to make this ventilator perform properly without success. Based on that, the entire unit may need to be replaced.



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Rye Jr. High School, Rye, NH

6. All the exterior doors need better weather stripping and thresholds. The goal should be that, when closed, one should not be able to daylight around any part of the door. Doors can be made to close even tighter but this must always be balanced with the need for the door to latch effectively after repeated use, especially on high-use entrances. A cost effective measure is to check the thresholds, sweeps, and weather-stripping of all the exterior doors and hatches once a year and replace as needed. Replacement parts from the original manufacturer are preferred if still available. Even old doors can serve very well if the weather stripping and sweeps are in good condition. Replacing otherwise functional doors just to increase R-value is generally not cost effective on a building of this type. The requirement for school doors to be secure and durable rules out the most energy efficient door types and “new” doors will only be marginally higher R-value than old doors. Metal doors are dimensionally stable, secure, and durable but they are thermally conductive even when they are insulated. The ideal metal door should have a thermal “break” between the interior panel and the exterior panel.
7. The main attic over the original school needs more r-value, up to at least R40. This attic also needs a continuous air barrier installed that is designed around the ventilation system that is up there. Repairs to the air barrier should start with the large attic access port that has no hatch. Because this attic is complicated by the ventilation penetrations more time will need to be dedicated to detailing the insulation and air sealing work before the project goes out to bid. Alternatively, this attic can be insulated in the plane of the roof with an air-tight insulation system. Given the size of this space the materials cost may be higher and staging may be required but the design is much simpler and will require less detailing beforehand.
8. There is no insulation or air barrier above the library, the acoustic tile ceiling is effectively the only barrier between the indoors and outdoors. The easiest approach would be to insulate with closed cell spray foam in the plane of the roof (R30) and the gable end walls (R19). This will put the thermal, air, and vapor barrier in the same plane as the roof structure which is a simple and effective design. No attic ventilation will be required as the attic will become part of the conditioned space. The spray foam may need to be covered by a 15-minute thermal barrier if it is not going to be fire taped with sheetrock. A local code official will have to rule on what type of thermal barrier is necessary. Insulation could also be installed in the horizontal plane just above the dropped ceiling and the cold attic above could be maintained. At present there isn’t much structure for that insulation to be affixed to so that would have to be built. This approach will also require the attic to be vented. Right now the attic has no venting system, it relies on the heat from below to drive moist air out of the building. Once a thermal and air barrier is in place above the ceiling this attic will need soffit and ridge ventilation in order to exhaust moist air effectively.
9. I found the 2 ceiling vents in the gym are left open most of the year, they can be closed but not easily. These vents need to be replaced with mechanical dampers that can be controlled from below or controlled by sensors.
10. The top of the gym at the wall to roof connection appeared cold at the time of the scan. This band seems to be associated with a metal beam at the top of the wall and is mostly conductive heat loss. It can be treated by insulating it from inside with rigid foam or spray foam carefully applied between the ceiling trusses.

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Rye Jr. High School, Rye, NH

11. Throughout the building the exterior walls appear to be pretty tight. No action required.
12. The new windows are airtight, with the exception of one room on the second floor where the sealed glass unit is falling out. The windows were also very easy to close and latch. This is important because windows that are not easy to close or latch often get left open because of apathy or frustration even when it is cold outside. Unfortunately, the aluminum window frames get very cold. For future window replacements an insulated, low conductivity frame should be selected.
13. There is 1 large opening in the mechanical room that is open directly to the outdoors. This opening supplies intake air to the boilers. It is correct to draw intake air from outside but it is more efficient and safer to have the intake air ducted directly to the boilers so the intake air and the exhaust form a closed loop to the outdoors. I understand that replacing the boilers may be happening soon. This would be a good time to properly connect the intake air to the boiler.

Cost Effective Measures:

1. Given that new boilers may be part of the upgrades to this building, money would be well spent on modeling the changes in heat load of the building with each of the major upgrades listed below. If the load goes down sufficiently a smaller boiler system may be required at a lower cost.
2. I believe that improving the main attic over the original school will have a significant impact on the heat loss of the school. Not only will conductive losses be reduced but also the stack effect will be reduced which will affect the entire building. The capital expense will be high so the payback term will likely still be several years.
3. Evaluating and improving the main ventilation system will also have a significant impact on the heat loss of this building.
4. Replacing the gym ceiling vents with mechanical dampers is a low cost fix that will payback in energy savings within 1 or 2 heating seasons.
5. Insulating the attic over the library has a relatively short payback term but I understand that this location may be slated for an addition soon. If the addition is further than 2 or 3 years out this attic should be insulated now.
6. Sealing the old ventilation system in the interior walls will have a moderate impact on the heat loss of the building by reducing the overall stack effect.
7. Fixing the AC vent in classroom 203 will have a small impact on the total heat loss of the building but should pay for itself quickly.
8. Properly weather-stripping all the exterior doors will probably result in a 5% or less reduction in total heating costs. Even so, this measure will be paid back within 1-3 years in energy savings.
9. Fixing the life skills unit ventilator will go very far in increasing the comfort in that room. It will have a small impact in reducing the stack effect of the building and in reducing total heat loss. If the unit can be fixed instead of replaced it will have a short payback term.

Conclusion:

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Rye Jr. High School, Rye, NH

There are many opportunities to increase the energy efficiency of the building shell at Rye Jr. High School. Thank you for contacting Building Envelope Solutions, Inc.

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Rye Elementary School, Rye, NH

October 15, 2008

To: Lucy Neiman, Jordan Institute
From: Jon Haehnel, Building Envelope Solutions, Inc.

RE: October 15th Scan and Blower Door Test at Rye Elementary School

Thank you for allowing Building Envelope Solutions, Inc. to help with your building envelope needs. The following report presents our findings and recommendations from our diagnostic visit. This report summarizes my findings from the infrared images and highlights the locations of significant heat loss.

Reported concerns: Seeking opportunities to improve energy efficiency.

Ambient conditions 10-15-08:

Outside temperature: 52 °F

Inside temperature: 70°F

Wind conditions: Calm

Time of day: 4:30 pm – 10:30 pm

Blower door test notes:

1. AC unit in room #153 stays in all winter.
2. Doors to the furnace room were masked because of the large combustion air intakes into the room.
3. Two air handlers were still on during the test, one next to room 153 and one next to room 165. Custodial staff could not locate the switches to turn them off.
4. All interior doors open.
5. All exterior doors and windows closed and latched.
6. 2 Fans were set up near room 101 and 2 fans were set up near room 153.

Blower Door Test Results:

1. The whole building leakage rate was 0.54 cubic feet per minute (CFM) at 50 Pascals of pressure (1.04 lbs./sq. ft) per unit area of exterior above grade shell. Most buildings in the United States are tested at the 50 Pascals of pressure as a means of comparison. We were not able to achieve a 50 Pascal pressure difference because of the size of the building but extrapolated the CFM at 50 Pascals from the reading we obtained at 17.5 Pascals.

| CFM @ 17.5 Pascals | Temperature adjusted CFM @ 50Pa. | Cubic feet of Building Volume | Air changes per hour @ 50Pa. | Square Feet of Building Shell | CFM50/sf of shell |
|--------------------|----------------------------------|-------------------------------|------------------------------|-------------------------------|-------------------|
| 21,120 | 42,673 | 802,390 | 3.19 | 78,861 | 0.54 |

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Rye Elementary School, Rye, NH

- The table below shows how the Rye Elementary School compares to other commercial construction.

| | CFM50/sf of shell |
|--|-------------------|
| Rye Elementary School | 0.54 |
| Local Museum constructed pre 1900. | 2.04 |
| US National Average for Commercial Buildings | 0.93 |
| Local High school (constructed 1958) | 1.29 |
| Typical Modern Construction | 0.60 to 0.90 |
| Local High Performance Building (major renovation to an art gallery) | 0.22 |
| Local High Performance Building (major renovation to a high school) | 0.17 |
| Local High Performance Building (new construction, middle school) | 0.19 |
| Local High Performance Building (major renovation, student center) | 0.23 |
| Local High Performance Building (new construction, student center) | 0.31 |

Notes for Understanding the Report:

- When viewing thermographs, lighter shades indicate higher surface temperatures than darker shades. What is considered “heat loss” is dependant upon the perspective from which it is viewed.
- Depressurization causes all outdoor air to flow inward and is not the normal operating state of the building. It is done to reveal conditions that would not normally be detected by the infrared camera or to enhance thermographic images. Depressurization is also used to mimic the environment a building would be under in conditions of high wind or very cold temperatures. The building was depressurized to about negative 18 Pascals during that part of the imaging.
- A copy of all the infrared images is included with the enclosed DVD.

Findings and Recommendations:

- The ceiling in original building (1957 building) seems to have a large amount of air leakage through it. During depressurization, at virtually any location in the 1957 building, a strong blast of cold air could be felt simply by lifting one of the ceiling tiles. Under normal operating conditions warm air exits through this ceiling to the outdoors. Given the relatively new membrane roof above, it is likely that the location of the air leaks is at the wall to roof connection. This condition can be repaired by foam sealing the wall to roof connection either from inside above the ceiling tiles or from outside if the soffit boards can easily be removed. Holes may need to be drilled between each of the wood planks of the roof deck in order to seal the small bypasses that form between roof planks. The exact repair approach should be tested by fog testing one room before repairs begin and then sealing the room at the wall to roof connection and retesting with fog to make sure the air leaks are significantly reduced. In addition, you will

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Rye Elementary School, Rye, NH

have to look above the dropped ceiling for any large air bypasses that exist where the 1957 building connects to other additions. These are common locations for air entry.

2. There is an old vent fan in room 100 that appears not to be in use. This fan should be removed and the hole permanently insulated and air sealed with rigid insulation and spray foam insulation.
3. Behind rooms 100 and 200 there is a crawlspace that is connected by vents to the outdoors. The access hatch to this crawl space should be insulated with at least 4" of rigid foam board and the door should be weather-stripped so that it foams a tight seal when closed. Latches should be installed to insure that the hatch cinches tightly to the weather-strip when closed.
4. The perimeter of the slab showed up a few degrees warmer all the way around the building. Given the limited exposure of the slab to the outside it is unlikely that insulating the slab from the outside will result in noticeable energy savings.
5. The windows appear to have been replaced recently and they close and latch tightly. The window sashes appear to be relatively airtight when closed and the connection between the window frame and the rough frame is also tight. In addition, they are double pane windows and appear to be sealed and gas-filled window units. Unfortunately, the aluminum frames of the windows are sources of heat loss and they are consistently cooler inside than the surface of the glass. I suspect that on very cold days condensation or frost forms on some of the window frames. Given that the windows are fairly new, I have no recommendations for the aluminum frames unless a condensation problem is especially bad in a given location. In that case, the window should be replaced either with a gas-filled, fiberglass framed window or an aluminum framed window that has a thermal break between the inside and outside framing members. For future window replacements an insulated, low conductivity frame should be selected.
6. The exterior doors on classrooms 100 and 200 have glass doors with aluminum frames that are not very airtight. I recommend replacing these doors with insulated doors. The door should be insulated and have a thermal "break" between the interior panel and the exterior panel. If it has a window, it should be a double pane, sealed window unit with argon or krypton gas. Low-e coatings are preferred in door glazing but matter very little in terms of heating efficiency.
7. All the exterior doors need better weather stripping and thresholds. The goal should be that, when closed, one should not be able to daylight around any part of the door. Doors can be made to close even tighter but this must always be balanced with the need for the door to latch effectively after repeated use, especially on high-use entrances. A cost effective measure is to check the thresholds, sweeps, and weather-stripping of all the exterior doors and hatches once a year and replace as needed. Replacement parts from the original manufacturer are preferred if still available. Even old doors can serve very well if the weather stripping and sweeps are in good condition. Replacing otherwise functional doors just to increase R-value is generally not cost effective on a building of this type. The requirement for school doors to be secure and durable rules out the most energy efficient door types and "new" doors will only be marginally higher R-value than old doors. Metal doors are dimensionally stable, secure, and durable but they are thermally conductive even when they are insulated. The ideal metal door should have a thermal "break" between the interior panel and the exterior panel.

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Rye Elementary School, Rye, NH

8. The wall base appeared to be relatively airtight throughout the building, very little air leakage noted where the wall meets the floor. This is common point of air entry in many buildings.
9. There are 2 large openings in the mechanical room that were open directly to the outdoors at the time of our scan. These openings supply intake air to the boilers and are generally left open. It is correct to draw intake air from outside but it is more efficient and safer to have the intake air ducted directly to the boilers so the intake air and the exhaust form a closed loop to the outdoors.

Cost Effective Measures:

1. The best opportunity to reduce the heat loss in this building is by sealing the wall to roof interface in the 1957 portion of the building with spray applied foam. This will be a relatively expensive repair measure so the payback term is not likely to be less than 5 years even if the energy savings are substantial.
2. Closing the vent fan hole in room 100 and insulating and sealing the crawlspace hatch are both low cost repairs that will pay for themselves in energy savings within the first year even though the energy savings from these measures will be low compared to the total energy consumption of the building. Rooms 100 and 200 will also be more comfortable because of these measures.
3. Replacing the doors in rooms 100 and 200 and properly weather-stripping all the exterior doors will probably result in a 5% or less reduction in total heating costs. Even so, this measure will be paid back within 1-3 years in energy savings.
4. I found no particular R-value deficiencies in either the walls or roof of this building. I believe the payback term for adding more insulation to the walls or roof, unless coordinated with a planned renovation or roof replacement, would be greater than 20 years at present fuel prices. In other words, the present level of insulation in the walls and roof is sufficient and to add more would not result in enough energy savings to justify the cost.

Conclusion:

Beyond item #1 listed above, I do not see large, low cost opportunities for increasing the efficiency of this building by improving the thermal envelope or air barrier of the building. Thank you for contacting Building Envelope Solutions, Inc.

Appendix D

LIGHTING ASSESSMENT REPORT

Lighting Audit Fixture Report

Rye Elementary School
61 Sagamore Rd; Rye, NH 03870-2028
Prepared By: Meghan Hoyer
Version: V2.0 11-14-08

LighTec, Inc.

Rye Elementary School Lighting Audit Fixture Report 11/14/2008

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|--------------|--|------------------------------------|--|------|------|----------------|
| Jr High School | | | | | | | |
| 1 | Common Lobby | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 8 | 8 | No Accessories |
| 2 | Main Office | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 2 | Main Office | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 2 | Main Office | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 3 | Principal | 1 Lamp 75W Edison base | Lamp Replacement | CFL 23W Spring | 1 | 1 | None |
| 3 | Principal | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 3 | Principal | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 4 | Mail Room | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 2 | 2 | None |
| 5 | Nurse | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 6 | 123B | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 6 | 123B | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 7 | 123 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-1 Ultrasonic Ceiling Mounted Sensor <500 sq ft & (2) PP | 0 | 1 | No accessories |
| 7 | 123 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|-----------------------|---|----------------------------------|--|------|------|----------------|
| Jr High School | | | | | | | |
| 7 | 123 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 8 | Hall Front of Nurse | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 8 | Hall Front of Nurse | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 9 | B&G Lavs | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 2 | No accessories |
| 9 | B&G Lavs | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 10 | Stairs | 65R30 Inc. Recessed Can | Relamp, Resocket w/GU24 & Clean | Kit 16W GU24 CFL R30 Flood & Socket | 1 | 1 | No Accessories |
| 10 | Stairs | 1x4 2L 34W T12 Wrap EE/EE Mag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 3 | 3 | No Accessories |
| 11 | Room 120 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 8 | 8 | No Accessories |
| 11 | Room 120 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 8 | 8 | No Accessories |
| 11 | Room 120 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-3 & (2) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 12 | Rooms 118 & 119 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-3 & (2) BZ-100 Dual Voltage Power Pack | 0 | 2 | No accessories |
| 12 | Rooms 118 & 119 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 16 | 16 | No Accessories |
| 12 | Rooms 118 & 119 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 16 | 16 | No Accessories |
| 13 | Stairs | 1x4 2L 34W T12 Wrap EE/EE Mag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 4 | 4 | No Accessories |
| 14 | Hall @ 119 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 15 | Kitchen (Vapor Tight) | 2(1x4) 2L Tand w/Std T8 Strip | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 7 | 7 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|--------------------------------|---|---------------------------------|---|------|------|----------------|
| Jr High School | | | | | | | |
| 15 | Kitchen (Vapor Tight) | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 16 | Kitchen | 1 Lamp 60W Jelly Jar | Lamp Replacement | Retro 1L 18W CFL Mini Spring | 3 | 3 | No Accessories |
| 17 | Hall @ sped | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 18 | Cafe | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 2 | No accessories |
| 18 | Cafe | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 24 | 24 | Remove A/B |
| 19 | Stage | 1L 150W Edison Base | Lamp Replacement | Retro CFL 42W Spring Edison base | 3 | 3 | No Accessories |
| 20 | Gym | No New System Required | Install Fixture Mounted Sensor | Fixture Installed Sensor | 0 | 20 | No accessories |
| 20 | Gym | 400W Metal Halide Highbay | New T5 Installation | NF 2X4 4 Lamp T5 Enclosed High Bay w/Silv Refl/Guard & Sensor | 20 | 20 | No Accessories |
| 21 | Chair Storage Room | 1 Lamp 60W Edison | Lamp Replacement | Retro 1L 18W CFL Mini Spring | 1 | 1 | None |
| 22 | Gym Exit Signs | LED Exit Sign Battery Backed w/Heads | No Change | No New System Required | 3 | 3 | No Accessories |
| 23 | Rooms 115, 116 SPED | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 23 | Rooms 115, 116 SPED | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 24 | Common Front of Cafe | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 13 | 13 | No Accessories |
| 25 | Trophy Case | 1x4 2L 34W T12 Ind. Strip EE/EE Mag | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 26 | Custodial Closet | 2L 1x8 Ind Strip w/Std T8 | Relamp & Clean | Relamp 2L 30W 841 | 1 | 1 | No Accessories |
| 27 | Lavs | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 4 | 4 | Remove A/B |
| 28 | Gym Foyer Common | 2x4 4L Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 5 | 5 | Remove A/B |
| 29 | Room 110 Teachers | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 4 | 4 | None |
| 30 | Short Hall @ Stairs to Library | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 31 | N/S Hall Near Library | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|-----------------------|---|-----------------------------------|---|------|------|----------------|
| Jr High School | | | | | | | |
| 31 | N/S Hall Near Library | 2x4 4L Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 32 | Library | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 2 | 2 | No Accessories |
| 32 | Library | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 1 | 1 | No Accessories |
| 32 | Library | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 5 | 5 | No Accessories |
| 32 | Library | 2x4 4L 34W T12 EE/EEMag Troff | Remove & Install Recessed Fixture | NF 2x4 3L 30W Prismatic Troff HP T8 BF L | 15 | 15 | No Accessories |
| 32 | Library | 1x8 1L Tandem 32W Wrap w/stdT8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 33 | Library Wall Sconces | 1 Lamp 75W Edison base | Install New CFL Fixture | 1L 13W 2Pin PL Twin Tube Wall Sconce | 8 | 8 | No Accessories |
| 34 | Floor two Top Stairs | 1x4 2L 34W T12 Wrap EE/EEMag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 1 | 1 | No Accessories |
| 34 | Floor two Top Stairs | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 1 | 1 | No Accessories |
| 34 | Floor two Top Stairs | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 35 | Room 201 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 8 | 8 | No Accessories |
| 35 | Room 201 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 35 | Room 201 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 36 | Rooms 216 & 218 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 10 | 10 | No Accessories |
| 36 | Rooms 216 & 218 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 10 | 10 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|----------------------|---|---------------------------------|---|------|------|----------------|
| Jr High School | | | | | | | |
| 36 | Rooms 216 & 218 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 2 | No accessories |
| 37 | Hall @ 218 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 38 | Stairs | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 38 | Stairs | 1x4 2L Wrap w/std T8 | Relamp, Reballast, & Clean | NF 1X4 1L 30W 841 Wrap w/Whl Refl HP T8 BF N | 4 | 4 | No Accessories |
| 39 | Rooms 209, 210,11,12 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 32 | 32 | No Accessories |
| 39 | Rooms 209, 210,11,12 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-3 & (2) BZ-100 Dual Voltage Power Pack | 0 | 4 | No accessories |
| 39 | Rooms 209, 210,11,12 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 32 | 32 | No Accessories |
| 40 | Stairs @ 210 | 1x4 2L Wrap w/std T8 | Relamp, Reballast, & Clean | NF 1X4 1L 30W 841 Wrap w/Whl Refl HP T8 BF N | 2 | 2 | No Accessories |
| 41 | Hall @ 211 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 42 | Room 204 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 42 | Room 204 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 42 | Room 204 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 7 | 7 | No Accessories |
| 42 | Room 204 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 7 | 7 | No Accessories |
| 43 | Storage Room | 2x4 2L Pris Troffer w/Std T8 | Relamp & Clean | Relamp 2L 30W 841 | 5 | 5 | No Accessories |
| 43 | Storage Room | No New System Required | Install Remote Occupancy Sensor | SEN CM-9 Low Voltage Ceiling mounted Sensor & Power Pack | 0 | 1 | No accessories |
| 44 | Custodians Room | 1x4 1L Ind Strip | No Change | No New System Required | 2 | 2 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|-------------------------|---|----------------------------------|--|------|------|----------------|
| Jr High School | | | | | | | |
| 45 | Guidance | 1x4 2L Ind Strip w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 46 | Common Outside Guidance | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 8 | 8 | No Accessories |
| 46 | Common Outside Guidance | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 5 | 5 | No Accessories |
| 47 | Computer Room | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 48 | Room 203 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 9 | 9 | No Accessories |
| 48 | Room 203 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 9 | 9 | No Accessories |
| 48 | Room 203 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-3 & (2) BZ-100 Dual Voltage Power Pack | 0 | 2 | No accessories |
| 49 | Room 202 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 49 | Room 202 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 49 | Room 202 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 49 | Room 202 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-1 Ultrasonic Ceiling Mounted Sensor <500 sq ft & (2) PP | 0 | 1 | No accessories |
| 50 | G&B Lavs | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 2 | No accessories |
| 50 | G&B Lavs | 2x4-2L-34W-T12-EE/EEMag Troffer | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 51 | Lower Level Rm 016 | 2(1x4) 2L Tandem w/std T8 | Remove & Install Surface Fixture | NF 1x8 30W 8411L Tand Wrap w/Wht Refl HP T8 BF N | 13 | 13 | No Accessories |
| 51 | Lower Level Rm 016 | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 6 | 6 | No Accessories |
| 52 | Lower Level 015 | 2(1x4) 2L Tandem w/std T8 | Remove & Install Surface Fixture | NF 1x8 30W 8411L Tand Wrap w/Wht Refl HP T8 BF N | 8 | 8 | No Accessories |
| 52 | Lower Level 015 | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 5 | 5 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|---------------------------|---|-----------------------------------|---|------|------|----------------|
| Jr High School | | | | | | | |
| 52 | Lower Level 015 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-3 & (2) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 53 | Band Rm 010 | No New System Required | Install Remote Occupancy Sensor | WAT UT-300-3 & (2) BZ-100 Dual Voltage Power Pack | 0 | 2 | No accessories |
| 53 | Band Rm 010 | 2(1x4) 2L Tandem w/std T8 | Remove & Install Surface Fixture | NF 1x8 30W 8411L Tand Wrap w/Wht Refl HP T8 BF N | 13 | 13 | No Accessories |
| 53 | Band Rm 010 | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 4 | 4 | No Accessories |
| 54 | Band Room Office | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 3 | 3 | No Accessories |
| 55 | Room 008 | 2x4 3L 34W T12 Pris Troffer EE/Std Mag | Remove & Install Recessed Fixture | NF 2x4 2L 30W BF N Prismatic Troffer | 12 | 12 | Remove A/B |
| 55 | Room 008 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 56 | T shaped Hall @ Rm 016 | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 12 | 12 | No Accessories |
| 57 | Lavs | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 6 | 6 | No Accessories |
| 58 | Room 017 | 2x4 4L 34W T12 EE/EEMag Pris Box | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 13 | 13 | No Accessories |
| 59 | Office | 2x4 4L 34W T12 EE/EEMag Pris Box | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 4 | 4 | No Accessories |
| 59 | Office | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No accessories |
| 60 | Hall | 1x4 2L 34W T12 Wrap EE/EEMag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 1 | 1 | No Accessories |
| 61 | Project Room | 1x4 2L 34W T12 Wrap EE/EEMag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 8 | 8 | No Accessories |
| 62 | Long Hall | 1x4 2L Wrap w/std T8 | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 13 | 13 | No Accessories |
| 63 | Boys Locker Room & Office | 1X2 2L F20T12 STD lamps/HPF(2) STD Magnetic ballast | Relamp, Reballast, & Clean | Retro 2L 17W 841 HP T8 BF L | 12 | 12 | No Accessories |
| 63 | Boys Locker Room & Office | 1x4 2L 34W T12 Wrap EE/EEMag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 2 | 2 | No Accessories |
| 63 | Boys Locker Room & Office | 65R30 Inc. Recessed Can | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 6 | 6 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|-----------------------|------------------|-----------------------------------|-----------------------------------|--|------------|------------|----------------|
| Jr High School | | | | | | | |
| 64 | Locker Room Hall | 2x4 2 Lamp Troffer T12 EE/STD Mag | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 8 | 6 | New Tiles |
| 65 | Base of Stairs | 2x4 4L 34W T12 EE/EEMag Pris Box | Remove & Install Recessed Fixture | NF 2x4 2L 30W BF L Prismatic Troffer | 2 | 2 | No Accessories |
| 65 | Base of Stairs | 2 Lamp 70W Drum | Remove & Install Surface Fixture | NF 1X4 1L 30W 841 Wrap w/Wht Refl HP T8 BF N | 1 | 1 | No Accessories |
| Jr High School | | | | | 598 | 645 | |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|-----------------------|---|--|--|------|------|-------------------|
| Rye Elementary School | | | | | | | |
| 1 | Foyer | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 2 | Boiler Room | 1x4 2L 34W T12 Ind. Strip EE/EEMag | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 8 | 4 | No Accessories |
| 3 | Office Common Space | 2 Lamp PL 26W Recessed Can | No Change | No New System Required | 1 | 1 | No Accessories |
| 3 | Office Common Space | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 4 | 4 | No Accessories |
| 4 | Office | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 4 | Office | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 4L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 5 | Conference Room | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 5 | Conference Room | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 4L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 5 | Conference Room | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No accessories |
| 6 | Office | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 4L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 6 | Office | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 7 | Copy Room | 2x4 3L Pris Troff w/std T8 A/B Switched | Delamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF N | 2 | 2 | Remove A/B Switch |
| 8 | Copy Room Hall | 1 Lamp 60W Recessed Can | Lamp Replacement | Retro 16W CFL R30 Flood | 1 | 1 | No Accessories |
| 9 | Office Lav | 2x2 2L Parabolic w/std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 10 | Common Space @ Office | 2x2 2L Prismatic w/std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 2 | 2 | No Accessories |
| 10 | Common Space @ Office | 2x2 2L Prismatic w/std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 2L Tandem 30W 841 6" Bend HP T8 BF L | 10 | 5 | No Accessories |
| 10 | Common Space @ Office | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 8 | 4 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|--------------------------------------|---|---|--|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 11 | Common Space @ Office Near Skylights | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W Dim BF .99 to <.45 w/ photocell | 4 | 4 | No Accessories |
| 11 | Common Space @ Office Near Skylights | No New System Required | Commission Dimming Ballast | Dimming Ballast | 0 | 4 | No accessories |
| 11 | Display Case | 1x4 2L Wrap w/std T8 | No Change | No New System Required | 2 | 2 | No Accessories |
| 12 | Exit Sign | LED Exit Sign Battery Backed | No Change | No New System Required | 3 | 3 | No Accessories |
| 13 | Room 110 Storage | 2(1x4) 2L Tandem w/std T8 | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 14 | Hall @ Room 104 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 14 | 7 | No Accessories |
| 14 | Hall @ Room 104 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 15 | Exit Signs | LED Exit Sign Battery Backed | No Change | No New System Required | 4 | 4 | No Accessories |
| 16 | Classrooms 101-108 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 4L 30W 841 HP T8 BF L | 48 | 48 | No Accessories |
| 16 | Classrooms 101-108 | No New System Required | Install Remote Occupancy Sensor | SEN WV-PDT Corner Mount Sensor & Power Pack | 0 | 8 | No accessories |
| 16 | Classrooms 101-108 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 48 | 48 | No Accessories |
| 17 | Classroom Lavs 101 - 108 | 2 Lamp 60W Drum | Install New CFL Fixture | NF-1L 32W Circline Drum | 16 | 16 | No Accessories |
| 19 | Custodial Closet near Offices | 1 Lamp 60W Edison | Lamp Replacement | Retro 1L 18W CFL Mini Spring | 1 | 1 | No Accessories |
| 20 | Open Space @ Gym | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 12 | 6 | No Accessories |
| 21 | Open Space @ Gym Near Skylights | No New System Required | Commission Dimming Ballast | Fixture Installed Sensor | 0 | 2 | No accessories |
| 21 | Open Space @ Gym Near Skylights | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L Dim BF .99 to <.45 w/ photocell | 2 | 2 | No Accessories |
| 21 | Foyer | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 22 | Exit Sign | LED Exit Sign Battery Backed | No Change | No New System Required | 2 | 2 | No Accessories |
| 23 | Room 193 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 14 | 7 | No Accessories |
| 23 | Room 193 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 7 | 7 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|--------------------------|---|---|---|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 23 | Room 193 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 24 | Room 191 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 14 | 7 | No Accessories |
| 24 | Room 191 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 24 | Room 191 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 7 | 7 | No Accessories |
| 25 | Room b/t rooms 193 & 191 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 25 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 4 | 2 | No Accessories |
| 25 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 26 | Exit Sign | LED Exit Sign Battery Backed | No Change | No New System Required | 2 | 2 | No Accessories |
| 27 | Sprinkler Room | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 29 | Mens Lav | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 29 | Mens Lav | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 29 | Mens Lav | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No Accessories |
| 30 | Womens Lav | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 30 | Womens Lav | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 30 | Womens Lav | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No accessories |
| 31 | Room 181 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 31 | Room 181 | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 31 | Room 181 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|--------------------|---|---|--|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 32 | Room 178 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 8 | 4 | No Accessories |
| 33 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 34 | Side Entry/Exit | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 35 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 36 | Rear Entrance/Exit | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 37 | Room 168 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 37 | Room 168 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 37 | Room 168 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 38 | Room 169 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 38 | Room 169 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 2 | 2 | No Accessories |
| 38 | Room 169 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 39 | Room 165 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 39 | Room 165 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 4 | 2 | No Accessories |
| 39 | Room 165 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 39 | Room 165 | No New System Required | Install Remote Occupancy Sensor | SEN WV-PDT Corner Mount Sensor & Power Pack | 0 | 1 | No accessories |
| 40 | Room 164 | No New System Required | Install Remote Occupancy Sensor | SEN WV-PDT Corner Mount Sensor & Power Pack | 0 | 1 | No accessories |
| 40 | Room 164 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|-----------------------|---|---|---|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 40 | Room 164 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 41 | Room 163 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 41 | Room 163 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 41 | Room 163 | No New System Required | Install Remote Occupancy Sensor | SEN WV-PDT Corner Mount Sensor & Power Pack | 0 | 1 | No accessories |
| 42 | Classroom 163 Offices | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 42 | Classroom 163 Offices | 1x4 2L Ind Strip w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | None |
| 42 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 42 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 8 | 4 | No Accessories |
| 43 | Room 155 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 43 | Room 155 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 43 | Room 155 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 43 | Room 155 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 44 | Room 153 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 44 | Room 153 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 44 | Room 153 | 2x4 3L Pris Troff w/std T8 A/B Switched | Relamp, Reballast, & Clean | NF 2x4 3L 30W Pris Troff one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|-------------|---|---|---|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 44 | Room 153 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 45 | Hall Closet | 1x4 1L Ind Strip | Relamp & Clean | Relamp 1L 30W 841K T8 | 1 | 1 | No Accessories |
| 49 | Room 151 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 49 | Room 151 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 49 | Room 151 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 49 | Room 151 | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 3L 30W 841 one 1L & one 2L HP T8 BF L A/B Switched | 1 | 1 | No Accessories |
| 50 | Room 150 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 50 | Room 150 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 50 | Room 150 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 50 | Room 150 | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 3L 30W HP T8 BF L | 1 | 1 | No Accessories |
| 51 | Room 149 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 6 | 6 | No Accessories |
| 51 | Room 149 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 51 | Room 149 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 1 | No accessories |
| 52 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 10 | 5 | No Accessories |
| 52 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|----------------------|------------------------------|--|--|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 53 | Mens Lav | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 53 | Mens Lav | No New System Required | Install Fixture Mounted Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | None |
| 53 | Mens Lav | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 54 | Womens Lav | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 54 | Womens Lav | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 1 | 1 | No Accessories |
| 54 | Womens Lav | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No accessories |
| 55 | Closet | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 56 | Room 148 | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 3L 30W HP T8 BF L | 20 | 20 | No Accessories |
| 56 | Room 148 | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 4 | 4 | No Accessories |
| 56 | Room 148 | No New System Required | Install Remote Occupancy Sensor | SEN WV-PDT Corner Mount Sensor & Power Pack | 0 | 2 | No accessories |
| 57 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 6 | 3 | No Accessories |
| 57 | Hallway | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 57 | Hallway | 2x2 2L Parabolic w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 32W 841 HP T8 6" Bend BF L | 2 | 2 | No Accessories |
| 58 | Room 147 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 59 | Closet | 1 Lamp 70W Edison Base | Lamp Replacement | CFL 23W Spring | 1 | 1 | No Accessories |
| 60 | Closet near room 140 | 1 Lamp 70W Edison Base | Lamp Replacement | CFL 23W Spring | 1 | 1 | No Accessories |
| 61 | Womens Room | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 61 | Womens Room | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No accessories |
| 62 | Mens Room | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 3 | 3 | No Accessories |
| 62 | Mens Room | No New System Required | Install Wall Switch Sensor | SEN WSD-PDT White Passive Dual Technology Occupancy Sensor | 0 | 1 | No accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|-------------------------------------|---|--|---|------|------|----------------|
| Rye Elementary School | | | | | | | |
| 63 | Rooms 128, 129, 131, 132, 134 & 135 | No New System Required | Install Remote Occupancy Sensor | WAT UT-305-2 Low Voltage Ultrasonic Ceiling Mount 360* <1000sq ft (no EMS) & (1) BZ-100 Dual Voltage Power Pack | 0 | 6 | No accessories |
| 63 | Rooms 128, 129, 131, 132, 134 & 135 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 4L 30W 841 HP T8 BF L | 36 | 36 | No Accessories |
| 63 | Rooms 128, 129, 131, 132, 134 & 135 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 36 | 36 | No Accessories |
| 64 | Room 133 | 2x4-2L-34W-T12-EE/EEMag Troffer | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 48 | 48 | No Accessories |
| 65 | Room 130 | 2x4 4L 34W T12 EE/EEMag Troff | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 65 | Room 130 | 2x4-2L-34W-T12-EE/EEMag Troffer | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 66 | Hall @ Room 127 | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 67 | Rooms 127 & 126 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 68 | Closet @ Room 126 | 1x4 1L Ind Strip | Relamp, Reballast, & Clean | Retro 1L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 69 | Rooms 122, 123, & 124 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 9 | 9 | No Accessories |
| 69 | Rooms 122, 123, & 124 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-4L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 4L 30W 841 HP T8 BF L | 9 | 9 | No Accessories |
| 70 | Room 120 Nurse | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 3L 30W HP T8 BF L | 4 | 4 | No Accessories |
| 71 | Rooms 140 & 141 | 2x4 3L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 3L 30W HP T8 BF L | 7 | 7 | No Accessories |
| 72 | Hallway | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, Clean & Tandem Wire | Retro 4L 30W 841 HP T8 BF L | 14 | 7 | No Accessories |
| 72 | Hallway | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 73 | Foyer @ Room 131 | 2x4 2L Pris Troffer w/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 74 | Entry/Exit Near Room 131 | 2 Lamp 60W Drum | Install New CFL Fixture | NF-1L 32W Circline Drum | 1 | 1 | No Accessories |
| 75 | Gym | No New System Required | Install Fixture Mounted Sensor | Fixture Installed Sensor | 0 | 18 | No accessories |
| 75 | Gym | 400W Metal Halide Highbay | New T5 Installation | NF 2X4 4LT5 Box w/spec refl/Guard /Cord/Sensor | 18 | 18 | None |
| 76 | Stage | 2(1x4) 2L Tandem w/std T8 | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|------------------------------|---------------------------|---|---|---|------------|------------|----------------|
| Rye Elementary School | | | | | | | |
| 77 | Kitchen | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 77 | Kitchen | 2(1x4) 2L Tandem w/std T8 | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 77 | Kitchen | 1 Lamp 60W Edison | Lamp Replacement | Retro 1L 18W CFL Mini Spring | 3 | 3 | No Accessories |
| 78 | Kitchen Storage | 1x4 2L VTw/std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 2 | 2 | No Accessories |
| 79 | Electric Room off Kitchen | 2(1x4) 2L Tandem w/std T8 | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 80 | Rooms 001 & 002 | 2x4 3L 32W STD T8 Troff A/B Switched | Relamp, Reballast, Clean, Tand Wire to A/B Switch | Retro 4L 30W 841 HP T8 BF L | 12 | 6 | No Accessories |
| 80 | Rooms 001 & 002 | 2x4 3L 32W STD T8 Troff A/B Switched and Tandem Wired (1-2L ballasts) | Relamp, Reballast, Clean & Maintain A/B Switch | Retro 2L 30W 841 HP T8 BF L | 12 | 6 | No Accessories |
| 80 | Rooms 001 & 002 | No New System Required | Install Remote Occupancy Sensor | SEN WV-PDT Corner Mount Sensor & Power Pack | 0 | 2 | No accessories |
| 81 | Rooms 1 & 2 Storage | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 4 | 4 | No Accessories |
| 81 | Hall @ Rooms 001 & 002 | 2(1x4) 2L Tandem w/std T8 | Relamp, Reballast, & Clean | Retro 4L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 81 | Hall @ Rooms 001 & 002 | 2x4 2L Pris Troffer w/Std T8 | Relamp, Reballast, & Clean | Retro 2L 30W 841 HP T8 BF L | 1 | 1 | No Accessories |
| 82 | Exterior | 1X1 70 W HPS | No Change | No New System Required | 6 | 6 | No Accessories |
| 82 | Exterior | 400 W HPS | No Change | No New System Required | 7 | 7 | No Accessories |
| 82 | Exterior | 150 W HPS | No Change | No New System Required | 3 | 3 | No Accessories |
| 82 | Exterior | 100 W HPS | No Change | No New System Required | 4 | 4 | No Accessories |
| Rye Elementary School | | | | | 736 | 692 | |

| Zone | Location | Existing Condition | Action | Proposed Condition | EQty | PQty | Accessories |
|--------------|----------|--------------------|--------|--------------------|------|------|-------------|
| Grand Total: | | | | | 1334 | 1337 | |

Appendix E

IMPLEMENTATION PHASE STANDARD CONTRACT

TEMPLATE 1992

AIA® Document B801™ CMA -

Standard Form of Agreement Between Owner and Construction Manager where the Construction Manager is NOT a Constructor

Editing Template

CAUTION: Take care not to remove or otherwise edit the FillPoint areas when making custom edits to this document.

AGREEMENT made as of the %[Day1] day of %[Month1] in the year %[Year1]
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name and address)

%[OwnerFullFirmName]
%[OwnerLongAddress]

and the Construction Manager:
(Name and address)

%[ConstructionManagerFullFirmName]
%[ConstructionManagerLongAddress]

for the following Project:
(Include detailed description of Project, location, address and scope.)

%[ProjectName]
%[ProjectLocation]
%[ProjectDescription]

The Architect is:
(Name and address)

%[ArchitectFullFirmName]
%[ArchitectLongAddress]

The Owner and Construction Manager agree as set forth below.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 CONSTRUCTION MANAGER'S RESPONSIBILITIES

§ 1.1 CONSTRUCTION MANAGER'S SERVICES

§ 1.1.1 The Construction Manager's services consist of those services performed by the Construction Manager, Construction Manager's employees and Construction Manager's consultants as enumerated in Articles 2 and 3 of this Agreement and any other services included in Article 14.

§ 1.1.2 The Construction Manager's services shall be provided in conjunction with the services of an Architect as described in the edition of AIA Document B141/CMA, Standard Form of Agreement Between Owner and Architect, Construction Manager-Adviser Edition, current as of the date of this Agreement.

§ 1.1.3 The Construction Manager shall provide sufficient organization, personnel and management to carry out the requirements of this Agreement in an expeditious and economical manner consistent with the interests of the Owner.

§ 1.1.4 The services covered by this Agreement are subject to the time limitations contained in Section 13.5.1.

ARTICLE 2 SCOPE OF CONSTRUCTION MANAGER'S BASIC SERVICES

§ 2.1 DEFINITION

§ 2.1.1 The Construction Manager's Basic Services consist of those described in Sections 2.2 and 2.3 and any other services identified in Article 14 as part of Basic Services.

§ 2.2 PRE-CONSTRUCTION PHASE

§ 2.2.1 The Construction Manager shall review the program furnished by the Owner to ascertain the requirements of the Project and shall arrive at a mutual understanding of such requirements with the Owner.

§ 2.2.2 The Construction Manager shall provide a preliminary evaluation of the Owner's program, schedule and construction budget requirements, each in terms of the other.

§ 2.2.3 Based on early schematic designs and other design criteria prepared by the Architect, the Construction Manager shall prepare preliminary estimates of Construction Cost for program requirements using area, volume or similar conceptual estimating techniques. The Construction Manager shall provide cost evaluations of alternative materials and systems.

§ 2.2.4 The Construction Manager shall expeditiously review design documents during their development and advise on proposed site use and improvements, selection of materials, building systems and equipment, and methods of Project delivery. The Construction Manager shall provide recommendations on relative feasibility of construction methods, availability of materials and labor, time requirements for procurement, installation and construction, and factors related to construction cost including, but not limited to, costs of alternative designs or materials, preliminary budgets, and possible economies.

§ 2.2.5 The Construction Manager shall prepare and periodically update a Project Schedule for the Architect's review and the Owner's acceptance. The Construction Manager shall obtain the Architect's approval for the portion of the preliminary project schedule relating to the performance of the Architect's services. In the Project Schedule, the Construction Manager shall coordinate and integrate the Construction Manager's services, the Architect's services and the Owner's responsibilities with anticipated construction schedules, highlighting critical and long-lead-time items.

§ 2.2.6 As the Architect progress with the preparation of the Schematic, Design Development and Construction Documents, the Construction Manager shall prepare and update, at appropriate intervals agreed to by the Owner, Construction Manager and Architect, estimates of Construction Cost of increasing detail and refinement. The estimated cost of each Contract shall be indicated with supporting detail. Such estimates shall be provided for the Architect's review and the Owner's approval. The Construction Manager shall advise the Owner and Architect if it appears that the Construction Cost may exceed the latest approved Project budget and make recommendations for corrective action.

§ 2.2.7 The Construction Manager shall consult with the Owner and Architect regarding the Construction Documents and make recommendations whenever design details adversely affect constructability, cost or schedules.

§ 2.2.8 The Construction Manager shall provide recommendations and information to the Owner and Architect regarding the assignment of responsibilities for temporary Project facilities and equipment, materials and services for common use of the Contractors. The Construction Manager shall verify that such requirements and assignment of responsibilities are included in the proposed Contract Documents.

§ 2.2.9 The Construction Manager shall provide recommendations and information to the Owner regarding the allocation of responsibilities for safety programs among the Contractors.

§ 2.2.10 The Construction Manager shall advise on the division of the Project into individual Contracts for various categories of Work, including the method to be used for selecting Contractors and awarding Contracts. If multiple Contracts are to be awarded, the Construction Manager shall review the Construction Documents and make recommendations as required to provide that (1) the Work of the Contractors is coordinated, (2) all requirements for the Project have been assigned to the appropriate Contract, (3) the likelihood of jurisdictional disputes has been minimized, and (4) proper coordination has been provided for phased construction.

§ 2.2.11 The Construction Manager shall prepare a Project construction schedule providing for the components of the Work, including phasing of construction, times of commencement and completion required of each Contractor, ordering and delivery of products requiring long lead time, and the occupancy requirements of the Owner. The Construction Manager shall provide the current Project construction schedule for each set of bidding documents.

§ 2.2.12 The Construction Manager shall expedite and coordinate the ordering and delivery of materials requiring long lead time.

§ 2.2.13 The Construction Manager shall assist the Owner in selecting, retaining and coordinating the professional services of surveyors, special consultants and testing laboratories required for the Project.

§ 2.2.14 The Construction Manager shall provide an analysis of the types and quantities of labor required for the Project and review the availability of appropriate categories of labor required for critical phases. The Construction Manager shall make recommendations for actions designed to minimize adverse effects of labor shortages.

§ 2.2.15 The Construction Manager shall assist the Owner in obtaining information regarding applicable requirements for equal employment opportunity programs for inclusion in the Contract Documents.

§ 2.2.16 Following the Owner's approval of the Construction Documents, the Construction Manager shall update and submit the latest estimate of Construction Cost and the Project construction schedule for the Architect's review and the Owner's approval.

§ 2.2.17 The Construction Manager shall submit the list of prospective bidders for the Architect's review and the Owner's approval.

§ 2.2.18 The Construction Manager shall develop bidders' interest in the Project and establish bidding schedules. The Construction Manager, with the assistance of the Architect, shall issue bidding documents to bidders and conduct prebid conferences with prospective bidders. The Construction Manager shall assist the Architect with regard to questions from bidders and with the issuance of addenda.

§ 2.2.19 The Construction Manager shall receive bids, prepare bid analyses and make recommendations to the Owner for the Owner's award of Contracts or rejection of bids.

§ 2.2.20 The Construction Manager shall assist the Owner in preparing Construction Contracts and advise the Owner on the acceptability of Subcontractors and material suppliers proposed by Contractors.

§ 2.2.21 The Construction Manager shall assist the Owner in obtaining building permits and special permits for permanent improvements, except for permits required to be obtained directly by the various Contractors. The Construction Manager shall verify that the Owner has paid applicable fees and assessments. The Construction Manager shall assist the Owner and Architect in connection with the Owner's responsibility for filing documents required for the approvals of governmental authorities having jurisdiction over the Project.

§ 2.3 CONSTRUCTION PHASE-ADMINISTRATION OF THE CONSTRUCTION CONTRACT

§ 2.3.1 The Construction Phase will commence with the award of the initial Construction Contract or purchase order and, together with the Construction Manager's obligation to provide Basic Services under this Agreement, will end 30 days after final payment to all Contractors is due.

§ 2.3.2 The Construction Manager shall provide administration of the Contracts for Construction in cooperation with the Architect as set forth below and in the edition of AIA Document A201/CMA, General Conditions of the Contract for Construction, Construction Manager-Adviser Edition, current as of the date of this Agreement.

§ 2.3.3 The Construction Manager shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Contractors with each other and with those of the Construction Manager, the Owner and the Architect to endeavor to manage the Project in accordance with the latest approved estimate of Construction Cost, the Project Schedule and the Contract Documents.

§ 2.3.4 The Construction Manager shall schedule and conduct meetings to discuss such matters as procedures, progress and scheduling. The Construction Manager shall prepare and promptly distribute minutes to the Owner, Architect and Contractors.

§ 2.3.5 Utilizing the Construction Schedules provided by the Contractors, the Construction Manager shall update the Project construction schedule incorporating the activities of the Contractors on the Project, including activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, Product Data and Samples, and delivery of products requiring long lead time and procurement. The Project construction schedule shall include the Owner's occupancy requirements showing portions of the Project having occupancy priority. The Construction Manager shall update and reissue the Project construction schedule as required to show current conditions. If an update indicates that the previously approved Project construction schedule may not be met, the Construction Manager shall recommend corrective action to the Owner and Architect.

§ 2.3.6 Consistent with the various bidding documents, and utilizing information from the Contractors, the Construction Manager shall coordinate the sequence of construction and assignment of space in areas where the Contractors are performing Work.

§ 2.3.7 The Construction Manager shall endeavor to obtain satisfactory performance from each of the Contractors. The Construction Manager shall recommend courses of action to the Owner when requirements of a Contract are not being fulfilled.

§ 2.3.8 The Construction Manager shall monitor the approved estimate of Construction Cost. The Construction Manager shall show actual costs for activities in progress and estimates for uncompleted tasks by way of comparison with such approved estimate.

§ 2.3.9 The Construction Manager shall develop cash flow reports and forecasts for the Project and advise the Owner and Architect as to variances between actual and budgeted or estimated costs.

§ 2.3.10 The Construction Manager shall maintain accounting records on authorized Work performed under unit costs, additional Work performed on the basis of actual costs of labor and materials, and other Work requiring accounting records.

§ 2.3.11 The Construction Manager shall develop and implement procedures for the review and processing of applications by Contractors for progress and final payments.

§ 2.3.11.1 Based on the Construction Manager's observations and evaluations of each Contractor's Application for Payment, the Construction Manager shall review and certify the amounts due the respective Contractors.

§ 2.3.11.2 The Construction Manager shall prepare a Project Application for Payment based on the Contractors' Certificates for Payment.

§ 2.3.11.3 The Construction Manager's certification for payment shall constitute a representation to the Owner, based on the Construction Manager's determinations at the site as provided in Section 2.3.13 and on the data comprising the Contractors' Applications for Payment, that, to the best of the Construction Manager's knowledge, information and belief, the Work has progressed to the point indicated and the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the Construction Manager. The issuance of a Certificate for Payment shall further constitute a representation that the Contractor is entitled to payment in the amount certified.

§ 2.3.11.4 The issuance of a Certificate for Payment shall not be a representation that the Construction Manager has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences for the Contractor's own Work, or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment or (4) ascertained how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 2.3.12 The Construction Manager shall review the safety programs developed by each of the Contractors for purposes of coordinating the safety programs with those of the other Contractors. The Construction Manager's responsibilities for coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 2.3.13 The Construction Manager shall determine in general that the Work of each Contractor is being performed in accordance with the requirements of the Contract Documents, endeavoring to guard the Owner against defects and deficiencies in the Work. As appropriate, the Construction Manager shall have authority, upon written authorization from the Owner, to require additional inspection or testing of the Work in accordance with the provisions of the Contract Documents, whether or not such Work is fabricated, installed or completed. The Construction Manager, in consultation with the Architect, may reject Work which does not conform to the requirements of the Contract Documents.

§ 2.3.14 The Construction Manager shall schedule and coordinate the sequence of construction in accordance with the Contract Documents and the latest approved Project construction schedule.

§ 2.3.15 With respect to each Contractor's own Work, the Construction Manager shall not have control over or charge of and shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work of each of the Contractors, since these are solely the Contractor's responsibility under the Contract for Construction. The Construction Manager shall not be responsible for a Contractor's failure to carry out the Work in accordance with the respective Contract Documents. The Construction Manager shall not have control over or charge of acts or omissions of the Contractors, Subcontractors, or their agents or employees, or any other persons performing portions of the Work not directly employed by the Construction Manager.

§ 2.3.16 The Construction Manager shall transmit to the Architect requests for interpretations of the meaning and intent of the Drawings and Specifications, and assist in the resolution of questions that may arise.

§ 2.3.17 The Construction Manager shall review requests for changes, assist in negotiating Contractors' proposals, submit recommendations to the Architect and Owner, and, if they are accepted, prepare Change Orders and Construction Change Directives which incorporate the Architect's modifications to the Documents.

§ 2.3.18 The Construction Manager shall assist the Architect in the review, evaluation and documentation of Claims.

§ 2.3.19 The Construction Manager shall receive certificates of insurance from the Contractors and forward them to the Owner with a copy to the Architect.

§ 2.3.20 In collaboration with the Architect, the Construction Manager shall establish and implement procedures for expediting the processing and approval of Shop Drawings, Product Data, Samples and other submittals. The

Construction Manager shall review all Shop Drawings, Product Data, Samples and other submittals from the Contractors. The Construction Manager shall coordinate submittals with information contained in related documents and transmit to the Architect those which have been approved by the Construction Manager. The Construction Manager's actions shall be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner or Contractors.

§ 2.3.21 The Construction Manager shall record the progress of the Project. The Construction Manager shall submit written progress reports to the Owner and Architect including information on each Contractor and each Contractor's Work, as well as the entire Project, showing percentages of completion. The Construction Manager shall keep a daily log containing a record of weather, each Contractor's Work on the site, number of workers, identification of equipment, Work accomplished, problems encountered, and other similar relevant data as the Owner may require.

§ 2.3.22 The Construction Manager shall maintain at the Project site for the Owner one record copy of all Contracts, Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition, approved Shop Drawings, Product Data, Samples and similar required submittals. The Construction Manager shall maintain records, in duplicate, of principal building layout lines, elevations of the bottom of footings, floor levels and key site elevations certified by a qualified surveyor or professional engineer. The Construction Manager shall make all such records available to the Architect and upon completion of the Project shall deliver them to the Owner.

§ 2.3.23 The Construction Manager shall arrange for the delivery, storage, protection and security of Owner-purchased materials, systems and equipment that are a part of the Project until such items are incorporated into the Project.

§ 2.3.24 With the Architect and the Owner's maintenance personnel, the Construction Manager shall observe the Contractors' final testing and start-up of utilities, operational systems and equipment.

§ 2.3.25 When the Construction Manager considers each Contractor's Work or a designated portion thereof substantially complete, the Construction Manager shall, jointly with the Contractor, prepare for the Architect a list of incomplete or unsatisfactory items and a schedule for their completion. The Construction Manager shall assist the Architect in conducting inspections to determine whether the Work or designated portion thereof is substantially complete.

§ 2.3.26 The Construction Manager shall coordinate the correction and completion of the Work. Following issuance of a Certificate of Substantial Completion of the Work or a designated portion thereof, the Construction Manager shall evaluate the completion of the Work of the Contractors and make recommendations to the Architect when Work is ready for final inspection. The Construction Manager shall assist the Architect in conducting final inspections.

§ 2.3.27 The Construction Manager shall secure and transmit to the Architect warranties and similar submittals required by the Contract Documents for delivery to the Owner and deliver all keys, manuals, record drawings and maintenance stocks to the Owner. The Construction Manager shall forward to the Architect a final Project Application for Payment upon compliance with the requirements of the Contract Documents.

§ 2.3.28 Duties, responsibilities and limitations of authority of the Construction Manager as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Construction Manager, Architect and Contractors. Consent shall not be unreasonably withheld.

ARTICLE 3 ADDITIONAL SERVICES

§ 3.1 GENERAL

§ 3.1.1 The services described in this Article 3 are not included in Basic Services unless so identified in Article 14, and they shall be paid for by the Owner as provided in this Agreement, in addition to the compensation for Basic Services. The Optional Additional Services described under Section 3.3 shall only be provided if authorized or confirmed in writing by the Owner. If services described under Contingent Additional Services in Section 3.2 are required due to circumstances beyond the Construction Manager's control, the Construction Manager shall notify the Owner prior to commencing such services. If the Owner deems that such services described under Section 3.2 are not required, the Owner shall give prompt written notice to the Construction Manager. If the Owner indicates in

writing that all or part of such Contingent Additional Services are not required, the Construction Manager shall have no obligation to provide those services.

§ 3.2 CONTINGENT ADDITIONAL SERVICES

§ 3.2.1 Providing services required because of significant changes in the Project including, but not limited to, changes in size, quality, complexity or the Owner's schedule.

§ 3.2.2 Providing consultation concerning replacement of Work damaged by fire or other cause during construction, and furnishing services required in connection with the replacement of such Work.

§ 3.2.3 Providing services made necessary by the termination or default of the Architect or a Contractor, by major defects or deficiencies in the Work of a Contractor, or by failure of performance of either the Owner or Contractor under a Contract for Construction.

§ 3.2.4 Providing services in evaluating an extensive number of claims submitted by a Contractor or others in connection with the Work.

§ 3.2.5 Providing services in connection with a public hearing, arbitration proceeding or legal proceeding except where the Construction Manager is party thereto.

§ 3.3 OPTIONAL ADDITIONAL SERVICES

§ 3.3.1 Providing services relative to future facilities, systems and equipment.

§ 3.3.2 Providing services to investigate existing conditions or facilities or to provide measured drawings thereof.

§ 3.3.3 Providing services to verify the accuracy of drawings or other information furnished by the Owner.

§ 3.3.4 Providing services required for or in connection with the Owner's selection, procurement or installation of furniture, furnishings and related equipment.

§ 3.3.5 Providing services for tenant improvements.

§ 3.3.6 Providing any other services not otherwise included in this Agreement.

ARTICLE 4 OWNER'S RESPONSIBILITIES

§ 4.1 The Owner shall provide full information regarding requirements for the Project, including a program which shall set forth the Owner's objectives, schedule, constraints and criteria, including space requirements and relationships, flexibility, expandability, special equipment, systems, and site requirements.

§ 4.2 The Owner shall establish and update an overall budget for the Project based on consultation with the Construction Manager and Architect, which shall include the Construction Cost, the Owner's other costs and reasonable contingencies related to all of these costs.

§ 4.3 If requested by the Construction Manager, the Owner shall furnish evidence that financial arrangements have been made to fulfill the Owner's obligations under this Agreement.

§ 4.4 The Owner shall designate a representative authorized to act on the Owner's behalf with respect to the Project. The Owner, or such authorized representative, shall render decisions in a timely manner pertaining to documents submitted by the Construction Manager in order to avoid unreasonable delay in the orderly and sequential progress of the Construction Manager's services.

§ 4.5 The Owner shall retain an architect whose services, duties and responsibilities are described in the edition of AIA Document B141/Cma, Standard Form of Agreement Between Owner and Architect, Construction Manager-Adviser Edition, current as of the date of this Agreement. The Terms and Conditions of the Agreement Between the Owner and Architect shall be furnished to the Construction Manager and shall not be modified without written consent of the Construction Manager, which consent shall not be unreasonably withheld. The Construction Manager shall not be responsible for actions taken by the Architect.

§ 4.6 The Owner shall furnish structural, mechanical, chemical, air and water pollution tests, tests for hazardous materials, and other laboratory and environmental tests, inspections and reports required by law or the Contract Documents.

§ 4.7 The Owner shall furnish all legal, accounting and insurance counseling services as may be necessary at any time for the Project, including auditing services the Owner may require to verify the Contractors' Applications for Payment or to ascertain how or for what purposes the Contractors have used the money paid by or on behalf of the Owner.

§ 4.8 The Owner shall furnish the Construction Manager with a sufficient quantity of Construction Documents.

§ 4.9 The services, information and reports required by Sections 4.5 through 4.8 shall be furnished at the Owner's expense, and the Construction Manager shall be entitled to rely upon the accuracy and completeness thereof.

§ 4.10 Prompt written notice shall be given by the Owner to the Construction Manager and Architect if the Owner becomes aware of any fault or defect in the Project or nonconformance with the Contract Documents.

§ 4.11 The Owner reserves the right to perform construction and operations related to the Project with the Owner's own forces, and to award contracts in connection with the Project which are not part of the Construction Manager's responsibilities under this Agreement. The Construction Manager shall notify the Owner if any such independent action will interfere with the Construction Manager's ability to perform the Construction Manager's responsibilities under this Agreement. When performing construction or operations related to the Project, the Owner agrees to be subject to the same obligations and to have the same rights as the Contractors.

§ 4.12 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Construction Manager's services and the progress of the Work.

ARTICLE 5 CONSTRUCTION COST

§ 5.1 DEFINITION

§ 5.1.1 The Construction Cost shall be the total cost or estimated cost to the Owner of all elements of the Project designed or specified by the Architect.

§ 5.1.2 The Construction Cost shall include the cost at current market rates of labor and materials furnished by the Owner and equipment designed, specified, selected or specially provided for by the Architect, plus a reasonable allowance for the Contractors' overhead and profit. In addition, a reasonable allowance for contingencies shall be included for market conditions at the time of bidding and for changes in the Work during construction. Except as provided in Section 5.1.3, Construction Cost shall also include the compensation of the Construction Manager and Construction Manager's consultants.

§ 5.1.3 Construction Cost does not include the compensation of the Architect and Architect's consultants, costs of the land, rights-of-way, financing or other costs which are the responsibility of the Owner as provided in Article 4. If any portion of the Construction Manager's compensation is based upon a percentage of Construction Cost, then Construction Cost, for the purpose of determining such portion, shall not include the compensation of the Construction Manager or Construction Manager's consultants.

§ 5.2 RESPONSIBILITY FOR CONSTRUCTION COST

§ 5.2.1 Evaluations of the Owner's Project budget, preliminary estimates of Construction Cost and detailed estimates of Construction Cost prepared by the Construction Manager represent the Construction Manager's best judgment as a person or entity familiar with the construction industry. It is recognized, however, that neither the Construction Manager nor the Owner has control over the cost of labor, materials or equipment, over Contractors' methods of determining bid prices, or over competitive bidding, market or negotiating conditions. Accordingly, the Construction Manager cannot and does not warrant or represent that bids or negotiated prices will not vary from the Project budget proposed, established or approved by the Owner, or from any cost estimate or evaluation prepared by the Construction Manager.

§ 5.2.2 No fixed limit of Construction Cost shall be established as a condition of this Agreement by the furnishing, proposal or establishment of a Project budget unless such fixed limit has been agreed upon in writing and signed by the parties hereto. If such a fixed limit has been established, the Construction Manager shall be permitted to include contingencies for design, bidding and price escalation, and shall consult with the Architect to determine what materials, equipment, component systems and types of construction are to be included in the Contract Documents, to suggest reasonable adjustments in the scope of the Project, and to suggest inclusion of alternate bids in the Construction Documents to adjust the Construction Cost to the fixed limit. Fixed limits, if any, shall be increased in the amount of any increase in the Contract Sums occurring after execution of the Contracts for Construction.

§ 5.2.3 If the Bidding or Negotiation Phase has not commenced within 90 days after submittal of the Construction Documents to the Owner, any Project budget or fixed limit of Construction Cost shall be adjusted to reflect changes in the general level of prices in the construction industry between the date of submission of the Construction Documents to the Owner and the date on which proposals are sought.

§ 5.2.4 If a fixed limit of Construction Cost (adjusted as provided in Section 5.2.3) is exceeded by the sum of the lowest bona fide bids or negotiated proposals plus the Construction Manager's estimate of other elements of Construction Cost for the Project, the Owner shall:

- .1 give written approval of an increase in such fixed limit;
- .2 authorize rebidding or renegotiating of the Project within a reasonable time;
- .3 if the Project is abandoned, terminate in accordance with Section 9.3; or
- .4 cooperate in revising the Project scope and quality as required to reduce the Construction Cost.

§ 5.2.5 If the Owner chooses to proceed under Section 5.2.4.4, the Construction Manager, without additional charge, shall cooperate with the Owner and Architect as necessary to bring the Construction Cost within the fixed limit, if established as a condition of this Agreement.

ARTICLE 6 CONSTRUCTION SUPPORT ACTIVITIES

§ 6.1 Construction support activities, if provided by the Construction Manager, shall be governed by separate contractual agreements unless otherwise provided in Article 14.

§ 6.2 Reimbursable expenses listed in Article 14 for construction support activities may be subject to trade discounts, rebates, refunds and amounts received from sales of surplus materials and equipment which shall accrue to the Owner, and the Construction Manager shall make provisions so that they can be secured.

ARTICLE 7 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

§ 7.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractors is described. The Construction Manager may retain one record set. The Construction Manager shall not own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Construction Manager's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Project. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Construction Manager, are for use solely with respect to this Project. They are not to be used by the Construction Manager on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Construction Manager is granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the performance of the Construction Manager's services under this Agreement.

All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

ARTICLE 8 ARBITRATION

§ 8.1 Claims, disputes or other matters in question between the parties to this Agreement arising out of or relating to this Agreement or breach thereof shall be subject to and decided by arbitration in accordance with the Construction

Industry Arbitration Rules of the American Arbitration Association currently in effect unless the parties mutually agree otherwise.

§ 8.2 Demand for arbitration shall be filed in writing with the other party to this Agreement and with the American Arbitration Association. A demand for arbitration shall be made within a reasonable time after the claim, dispute or other matter in question has arisen. In no event shall the demand for arbitration be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statutes of limitations.

§ 8.3 No arbitration arising out of or relating to this Agreement shall include, by consolidation, joinder or in any other manner, an additional person or entity not a party to this Agreement, except by written consent containing a specific reference to this Agreement signed by the Owner, Construction Manager, and any other person or entity sought to be joined. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by the parties to this Agreement shall be specifically enforceable in accordance with applicable law in any court having jurisdiction thereof.

§ 8.4 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 9 TERMINATION, SUSPENSION OR ABANDONMENT

§ 9.1 This Agreement may be terminated by either party upon not less than seven days' written notice should the other party fail substantially to perform in accordance with the terms of this Agreement through no fault of the party initiating the termination.

§ 9.2 If the Project is suspended by the Owner for more than 30 consecutive days, the Construction Manager shall be compensated for services performed prior to notice of such suspension. When the Project is resumed, the Construction Manager's compensation shall be equitably adjusted to provide for expenses incurred in the interruption and resumption of the Construction Manager's services.

§ 9.3 This Agreement may be terminated by the Owner upon not less than seven days' written notice to the Construction Manager in the event that the Project is permanently abandoned. If the Project is abandoned by the Owner for more than 90 consecutive days, the Construction Manager may terminate this Agreement by giving written notice.

§ 9.4 Failure of the Owner to make payments to the Construction Manager in accordance with this Agreement shall be considered substantial nonperformance and cause for termination.

§ 9.5 If the Owner fails to make payment when due the Construction Manager for services and expenses, the Construction Manager may, upon seven days' written notice to the Owner, suspend performance of services under this Agreement. Unless payment in full is received by the Construction Manager within seven days of the date of the notice, the suspension shall take effect without further notice. In the event of a suspension of services, the Construction Manager shall have no liability to the Owner for delay or damage caused to the Owner because of such suspension of services.

§ 9.6 In the event of termination not the fault of the Construction Manager, the Construction Manager shall be compensated for services performed prior to termination, together with Reimbursable Expenses then due and all Termination Expenses as defined in Section 9.7.

§ 9.7 Termination Expenses are those costs directly attributable to termination for which the Construction Manager is not otherwise compensated.

ARTICLE 10 MISCELLANEOUS PROVISIONS

§ 10.1 Unless otherwise provided, this Agreement shall be governed by the law of the place where the Project is located.

§ 10.2 Terms in this Agreement shall have the same meaning as those in the edition of AIA Document A201/CMA, General Conditions of the Contract for Construction, Construction Manager-Adviser Edition, current as of the date of this Agreement.

§ 10.3 Causes of action between the parties to this Agreement pertaining to acts or failures to act shall be deemed to have accrued and the applicable statutes of limitations shall commence to run not later than either the date of Substantial Completion for acts or failures to act occurring prior to Substantial Completion, or the date of issuance of the final Project Certificate for Payment for acts or failures to act occurring after Substantial Completion.

§ 10.4 Waivers of Subrogation. The Owner and Construction Manager waive all rights against each other and against the Contractors, Architect, consultants, agents and employees of any of them, for damages, but only to the extent covered by property insurance during construction, except such rights as they may have to the proceeds of such insurance as set forth in the edition of AIA Document A201/CMA, General Conditions of the Contract for Construction, Construction Manager-Adviser Edition, current as of the date of this Agreement. The Owner and Construction Manager each shall require similar waivers from their Contractors, Architect, consultants, agents, and persons or entities awarded separate contracts administered under the Owner's own forces.

§ 10.5 The Owner and Construction Manager, respectively, bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants of this Agreement. Neither Owner nor Construction Manager shall assign this Agreement without the written consent of the other.

§ 10.6 This Agreement represents the entire and integrated agreement between the Owner and Construction Manager and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both Owner and Construction Manager.

§ 10.7 Nothing contained in this Agreement shall create a contractual relationship with or a cause of action in favor of a third party against either the Owner or Construction Manager.

§ 10.8 Unless otherwise provided in this Agreement, the Construction Manager and the Construction Manager's consultants shall have no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials in any form at the Project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (PCB) or other toxic substances.

ARTICLE 11 INSURANCE

§ 11.1 CONSTRUCTION MANAGER'S LIABILITY INSURANCE

§ 11.1.1 The Construction Manager shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Construction Manager from claims set forth below which may arise out of or result from the Construction Manager's operations under this Agreement and for which the Construction Manager may be legally liable.

- .1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the operations to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Construction Manager's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Construction Manager's employees;
- .4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Construction Manager, or (2) by another person;
- .5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in Article 14 or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or

claims-made basis, shall be maintained without interruption from date of commencement of operations under this Agreement until date of final payment and termination of any coverage required to be maintained after final payment.

ARTICLE 12 PAYMENTS TO THE CONSTRUCTION MANAGER

§ 12.1 DIRECT PERSONNEL EXPENSE

§ 12.1.1 Direct Personnel Expense is defined as the direct salaries of the Construction Manager's personnel engaged on the Project and the portion of the cost of their mandatory and customary contributions and benefits related thereto, such as employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions and similar contributions and benefits.

§ 12.2 REIMBURSABLE EXPENSES

§ 12.2.1 Reimbursable Expense are in addition to compensation for Basic and Additional Services and include expenses incurred by the Construction Manager and Construction Manager's employees and consultants in the interest of the Project, as identified in the following Clauses.

§ 12.2.1.1 Expense of transportation in connection with the Project, expenses in connection with authorized out-of-town travel; long-distance communications; and fees paid for securing approval of authorities having jurisdiction over the Project.

§ 12.2.1.2 Expense of reproductions, postage, express deliveries, electronic facsimile transmissions and handling of Drawings, Specifications and other documents.

§ 12.2.1.3 If authorized in advance by the Owner, expense of overtime work requiring higher than regular rates.

§ 12.2.1.4 Expense of additional insurance coverage or limits requested by the Owner in excess of that normally carried by the Construction Manager.

§ 12.3 PAYMENTS ON ACCOUNT OF BASIC SERVICES

§ 12.3.1 An initial payment as set forth in Section 13.1 is the minimum payment under this Agreement.

§ 12.3.2 Subsequent payments for Basic Services shall be made monthly and, where applicable, shall be in proportion to services performed within each phase of service, on the basis set forth in Section 13.2.1.

§ 12.3.3 If and to the extent that the time initially established in Section 13.5.1 of this Agreement is exceeded or extended through no fault of the Construction Manager, compensation for any services rendered during the additional period of time shall be computed in the manner set forth in Section 13.3.1.

§ 12.3.4 When compensation is based on a percentage of Construction Cost and any portions of the Project are deleted or otherwise not constructed, compensation for those portions of the Project shall be payable to the extent services are performed on those portions, in accordance with Section 13.2.1, based on (1) the lowest bona fide bids or negotiated proposals, or (2) if no such bids or proposals are received, the latest approved estimate of such portions of the Project.

§ 12.4 PAYMENTS ON ACCOUNT OF ADDITIONAL SERVICES AND REIMBURSABLE EXPENSES

§ 12.4.1 Payments on account of the Construction Manager's Additional Services and for Reimbursable Expenses shall be made monthly upon presentation of the Construction Manager's statement of services rendered or expenses incurred.

§ 12.5 PAYMENTS WITHHELD

§ 12.5.1 No deductions shall be made from the Construction Manager's compensation on account of penalty, liquidated damages or other sums withheld from payments to Contractors, or on account of the cost of changes in Work other than those for which the Construction Manager has been found to be liable.

§ 12.6 CONSTRUCTION MANAGER'S ACCOUNTING RECORDS

§ 12.6.1 Records of Reimbursable Expenses and expenses pertaining to Additional Services and services performed on the basis of a multiple of Direct Personnel Expense shall be available to the Owner or the Owner's authorized representative at mutually convenient times.

ARTICLE 13 BASIS OF COMPENSATION

The Owner shall compensate the Construction Manager as follows:

§ 13.1 AN INITIAL PAYMENT of **%[InitialPaymentWords]** (\$ **%[InitialPayment]**) shall be made upon execution of this Agreement and credited to the owner's account at final payment.

§ 13.2 BASIC COMPENSATION

§ 13.2.1 FOR BASIC SERVICES, as described in Article 2, and any other services included in Article 14 as part of Basic Services, Basic Compensation shall be computed as follows:

For Pre-Construction Phase Services:

(Insert basis of compensation, including stipulated sums, multiples or percentages.)

%[PreConstructionServices]

For Construction Phase Services:

(Insert basis of compensation, including stipulated sums, multiples or percentages.)

%[ConstructionServices]

§ 13.3 COMPENSATION FOR ADDITIONAL SERVICES

§ 13.3.1 FOR ADDITIONAL SERVICES OF THE CONSTRUCTION MANAGER, as described in Article 3, and any other services included in Article 14 as Additional Services, compensation shall be computed as follows:

(Insert basis of compensation, including rates and/or multiples of Direct Personnel Expense for Principals and employees, and identify Principals and classify employees, if required. Identify specific services to which particular methods of compensation apply, if necessary.)

%[AddServicesComp]

§ 13.4 REIMBURSABLE EXPENSES

§ 13.4.1 FOR REIMBURSABLE EXPENSES, as described in Section 12.2, and any other items included in Article 14 as Reimbursable Expenses, a multiple of **%[ReimbursableExpensesWords]** (**%[ReimbursableExpenses]**) times the expenses incurred by the Construction Manager and the Construction Manager's employees and consultants in the interest of the Project.

§ 13.5 ADDITIONAL PROVISIONS

§ 13.5.1 IF THE BASIC SERVICES covered by this Agreement have not been completed within **%[ExtensionOfServicesWords]** (**%[ExtensionOfServices]**) months of the date hereof, through no fault of the Construction Manager, extension of the Construction Manager's services beyond that time shall be compensated as provided in Sections 12.3.3 and 13.3.1.

§ 13.5.2 Payments are due and payable **%[PmtDueAfterWords]** (**%[PmtDueAfter]**) days from the date of the Construction Manager's invoice. Amounts unpaid **%[DaysForInterestWords]** (**%[DaysForInterest]**) days after the invoice date shall bear interest at the rate entered below, or in the absence thereof at the legal rate prevailing from time to time at the principal place of business of the Construction Manager.

(Insert rate of interest agreed upon.)

%[InterestOverdue] **%[BasisOfInterest]**

(Usury laws and requirements under the Federal Truth in Lending Act, similar state and local consumer credit laws and other regulations at the Owner's and Construction Manager's principal places of business, the location of the

Project and elsewhere may affect the validity of this provision. Specific legal advice should be obtained with respect to deletions or modifications, and also regarding requirements such as written disclosures or waivers.)

§ 13.5.3 The rates and multiples set forth for Additional Services shall be annually adjusted in accordance with normal salary review practices of the Construction Manager.

ARTICLE 14 OTHER CONDITIONS OR SERVICES

(Insert descriptions of other services, identify Additional Services included within Basic Compensation and modifications to the payment and compensation terms included in this Agreement.)

[%[OtherServices]

§ 14.1 LIMITS ON INSURANCE

The insurance required by Article 11 shall be written for not less than the following limits, or greater if required by law:

(Insert the specific dollar amounts for the appropriate insurance limits of liability.)

Type of insurance

[%[ForEachBlock("loi",
LimitsOnInsurance))][loi.TypeOfInsurance]

Limit of liability (\$ 0.00)

[%[FormatNum(loi.LimitOfLiability,"%.2m")][
EndBlock()]

This Agreement entered into as of the day and year first written above.

OWNER

CONSTRUCTION MANAGER

(Signature)

[%[OwnerRepName)][OwnerRepTitle]

(Printed name and title)

(Signature)

[%[ConstructionManagerRepName)][Construction
ManagerRepTitle]

(Printed name and title)

General Conditions of the Contract for Construction where
the Construction Manager is NOT a Constructor

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(Name and location or address):

%[ProjectName]
%[ProjectLocation]

THE OWNER:
(Name and address):

%[OwnerFullFirmName]
%[OwnerLongAddress]

THE ARCHITECT:
(Name and address):

%[ArchitectFullFirmName]
%[ArchitectLongAddress]

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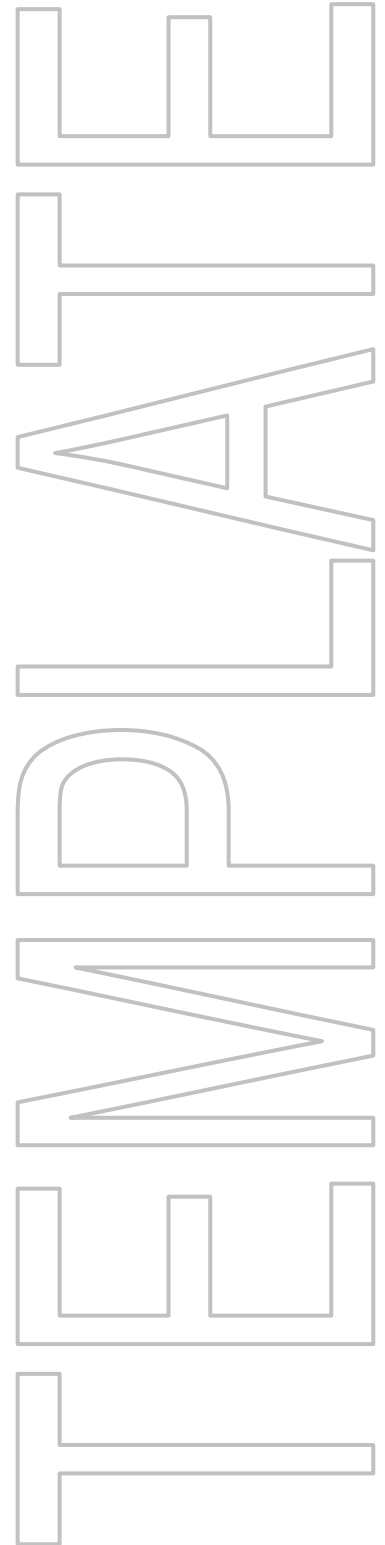
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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of addenda relating to bidding requirements).

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Construction Manager and Contractor, (3) between the Architect and Construction Manager, (4) between the Owner and a Subcontractor or Sub-subcontractor or (5) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors and by the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 THE PROJECT MANUAL

The Project Manual is the volume usually assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

§ 1.2 EXECUTION, CORRELATION AND INTENT

§ 1.2.1 The Contract Documents shall be signed by the Owner and Contractor as provided in the Agreement. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

§ 1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent

consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

§ 1.2.4 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.5 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

§ 1.3.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

§ 1.4 CAPITALIZATION

§ 1.4.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.5 INTERPRETATION

§ 1.5.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2 OWNER

§ 2.1 DEFINITION

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner upon reasonable written request shall furnish to the Contractor in writing information which is necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein at the time of execution of the Agreement and, within five days after any change, information of such change in title, recorded or unrecorded.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 The Owner shall, at the request of the Contractor, prior to execution of the Agreement and promptly from time to time thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract.

[Note: Unless such reasonable evidence were furnished on request prior to the execution of the Agreement, the prospective contractor would not be required to execute the Agreement or to commence the Work.]

§ 2.2.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

§ 2.2.3 Except for permits and fees which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit.

§ 2.2.4 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in orderly progress of the Work.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

§ 2.2.6 The Owner shall forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect.

§ 2.2.7 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Other Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

§ 2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

§ 2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a second seven-day period. If the Contractor within such second seven-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Construction Manager's and Architect's and their respective consultants' additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 DEFINITION

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout this Agreement as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The plural term "Contractors" refers to persons or entities who perform construction under Conditions of the Contract that are administered by the Construction Manager, and that are identical or substantially similar to these Conditions.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Section 2.2.2 and shall at once report to the Construction Manager and Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner, Construction Manager or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistency or omission and knowingly failed to report it to the Construction Manager and Architect. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Construction Manager and Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

§ 3.2.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Construction Manager and Architect at once.

§ 3.2.3 The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Section 3.12.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under this Contract, subject to overall coordination of the Construction Manager as provided in Sections 4.6.3 and 4.6.4.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.

§ 3.3.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

§ 3.3.4 The Contractor shall inspect portions of the Project related to the Contractor's Work in order to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 3.5 WARRANTY

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

§ 3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES AND NOTICES

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for the building permit and the Contractor shall secure and pay for all other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules and regulations and lawful orders of public authorities bearing on performance of the Work.

§ 3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Construction Manager, Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

§ 3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Construction Manager, Architect and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contractor makes reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- .1 materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay in the Work;
- .2 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .3 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances;
- .4 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.2 and (2) changes in Contractor's costs under Section 3.8.2.3.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information and the Construction Manager's approval a Contractor's Construction Schedule for the Work. Such schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project construction schedule to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict, delay in or interference with the Work of other Contractors or the construction or operations of the Owner's own forces.

§ 3.10.3 The Contractor shall prepare and keep current, for the Construction Manager's and Architect's approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Construction Manager and Architect reasonable time to review submittals.

§ 3.10.4 The Contractor shall conform to the most recent schedules.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

§ 3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Construction Manager and Architect and shall be delivered to the Construction Manager for submittal to the Owner upon completion of the Work.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Section 4.6.12.

§ 3.12.5 The Contractor shall review, approve and submit to the Construction Manager, in accordance with the schedule and sequence approved by the Construction Manager, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples and similar submittals with related documents submitted by other Contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

§ 3.12.6 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Construction Manager and Architect. Such Work shall be in accordance with approved submittals.

§ 3.12.7 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Construction Manager's and Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Construction Manager and Architect in writing of such deviation at the time of submittal and the Construction Manager and Architect have given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Construction Manager's and Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals.

§ 3.12.10 Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents.

§ 3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Construction Manager and Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

§ 3.13 USE OF SITE

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner's own forces or of other Contractors by cutting, patching, excavating or otherwise altering such construction. The Contractor shall not cut or otherwise alter such construction by other Contractors or by the Owner's own forces except with written consent of the Construction Manager, Owner and such other Contractors; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the other Contractors or the Owner the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Construction Manager may do so with the Owner's approval and the cost thereof shall be charged to the Contractor.

§ 3.16 ACCESS TO WORK

§ 3.16.1 The Contractor shall provide the Owner, Construction Manager and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES AND PATENTS

§ 3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner, Construction Manager and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in part by

negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section 3.18 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

§ 3.18.3 The obligations of the Contractor under this Section 3.18 shall not extend to the liability of the Construction Manager, Architect, their consultants, and agents and employees of any of them arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Construction Manager, Architect, their consultants, and agents and employees of any of them provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

§ 4.1 ARCHITECT

§ 4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

§ 4.2 CONSTRUCTION MANAGER

§ 4.2.1 The Construction Manager is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Construction Manager" means the Construction Manager or the Construction Manager's authorized representative.

§ 4.3 Duties, responsibilities and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Construction Manager, Architect and Contractor. Consent shall not be unreasonably withheld.

§ 4.4 In case of termination of employment of the Construction Manager or Architect, the Owner shall appoint a construction manager or architect against whom the Contractor makes no reasonable objection and whose status under the Contract Documents shall be that of the former construction manager or architect, respectively.

§ 4.5 Disputes arising under Sections 4.3 and 4.4 shall be subject to arbitration.

§ 4.6 ADMINISTRATION OF THE CONTRACT

§ 4.6.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents, and will be the Owner's representatives (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the correction period described in Section 12.2. The Construction Manager and Architect will advise and consult with the Owner and will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with other provisions of the Contract.

§ 4.6.2 The Construction Manager will determine in general that the Work is being performed in accordance with the requirements of the Contract Documents, will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

§ 4.6.3 The Construction Manager will provide for coordination of the activities of other Contractors and of the Owner's own forces with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other Contractors and the Construction Manager and Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed

necessary after a joint review and mutual agreement. The construction schedules shall constitute the schedules to be used by the Contractor, other Contractors, the Construction Manager and the Owner until subsequently revised.

§ 4.6.4 The Construction Manager will schedule and coordinate the activities of the Contractors in accordance with the latest approved Project construction schedule.

§ 4.6.5 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an architect, the Architect will keep the Owner informed of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

§ 4.6.6 The Construction Manager, except to the extent required by Section 4.6.4, and Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Section 3.3, and neither will be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of or be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

§ 4.6.7 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall communicate through the Construction Manager, and shall contemporaneously provide the same communications to the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect.

§ 4.6.8 The Construction Manager will review and certify all Applications for Payment by the Contractor, including final payment. The Construction Manager will assemble each of the Contractor's Applications for Payment with similar Applications from other Contractors into a Project Application and Project Certificate for Payment. After reviewing and certifying the amounts due the Contractors, the Construction Manager will submit the Project Application and Project Certificate for Payment, along with the applicable Contractors' Applications and Certificates for Payment, to the Architect.

§ 4.6.9 Based on the Architect's observations and evaluations of Contractors' Applications for Payment, and the certifications of the Construction Manager, the Architect will review and certify the amounts due the Contractors and will issue a Project Certificate for Payment.

§ 4.6.10 The Architect will have authority to reject Work which does not conform to the Contract Documents, and to require additional inspection or testing, in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed, but will take such action only after notifying the Construction Manager. Subject to review by the Architect, the Construction Manager will have the authority to reject Work which does not conform to the Contract Documents. Whenever the Construction Manager considers it necessary or advisable for implementation of the intent of the Contract Documents, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.6.18 through 4.6.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.6.10 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.6.11 The Construction Manager will receive from the Contractor and review and approve all Shop Drawings, Product Data and Samples, coordinate them with information received from other Contractors, and transmit to the

Architect those recommended for approval. The Construction Manager's actions will be taken with such reasonable promptness as to cause no delay in the Work of the Contractor or in the activities of other Contractors, the Owner, or the Architect.

§ 4.6.12 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work of the Contractor or in the activities of the other Contractors, the Owner, or the Construction Manager, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.6.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.6.14 Following consultation with the Construction Manager, the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7 and will have authority to order minor changes in the Work as provided in Section 7.4.

§ 4.6.15 The Construction Manager will maintain at the site for the Owner one record copy of all Contracts, Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record all changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.6.16 The Construction Manager will assist the Architect in conducting inspections to determine the dates of Substantial Completion and final completion, and will receive and forward to the Architect written warranties and related documents required by the Contract and assembled by the Contractor. The Construction Manager will forward to the Architect a final Project Application and Project Certificate for Payment upon compliance with the requirements of the Contract Documents.

§ 4.6.17 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.6.18 The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of the Construction Manager, Owner or Contractor. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Section 4.6, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

§ 4.6.19 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.6.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.7 CLAIMS AND DISPUTES

§ 4.7.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 4.7.2 Decision of Architect. Claims, including those alleging an error or omission by the Construction Manager or Architect, shall be referred initially to the Architect for action as provided in Section 4.8. A decision by the Architect, as provided in Section 4.8.4, shall be required as a condition precedent to arbitration or litigation of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work or (2) the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to arbitration or litigation in the event (1) the position of Architect is vacant, (2) the Architect has not received evidence or has failed to render a decision within agreed time limits, (3) the Architect has failed to take action required under Section 4.8.4 within 30 days after the Claim is made, (4) 45 days have passed after the Claim has been referred to the Architect or (5) the Claim relates to a mechanic's lien.

§ 4.7.3 Time Limits on Claims. Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

§ 4.7.4 Continuing Contract Performance. Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 4.7.5 Waiver of Claims: Final Payment. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 4.7.6 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Section 4.8.

§ 4.7.7 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with the procedure established herein.

§ 4.7.8 Claims for Additional Time.

§ 4.7.8.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 4.7.8.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.

§ 4.7.9 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in Sections 4.7.7 or 4.7.8.

§ 4.8 RESOLUTION OF CLAIMS AND DISPUTES

§ 4.8.1 The Architect will review Claims and take one or more of the following preliminary actions within ten days of receipt of a Claim: (1) request additional supporting data from the claimant, (2) submit a schedule to the parties indicating when the Architect expects to take action, (3) reject the Claim in whole or in part, stating reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

§ 4.8.2 If a Claim has been resolved, the Architect will prepare or obtain appropriate documentation.

§ 4.8.3 If a Claim has not been resolved, the party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

§ 4.8.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days, which decision shall be final and binding on the parties but subject to arbitration. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 4.9 ARBITRATION

§ 4.9.1 Controversies and Claims Subject to Arbitration. Any controversy or Claim arising out of or related to the Contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator or arbitrators may be entered in any court having jurisdiction thereof, except controversies or Claims relating to aesthetic effect and except those waived as provided for in Section 4.7.5. Such controversies or Claims upon which the Architect has given notice and rendered a decision as provided in Section 4.8.4 shall be subject to arbitration upon written demand of either party. Arbitration may be commenced when 45 days have passed after a Claim has been referred to the Architect as provided in Section 4.7 and no decision has been rendered.

§ 4.9.2 Rules and Notices for Arbitration. Claims between the Owner and Contractor not resolved under Section 4.8 shall, if subject to arbitration under Section 4.9.1, be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect, unless the parties mutually agree otherwise. Notice of demand for arbitration shall be filed in writing with the other party to the Agreement between the Owner and Contractor and with the American Arbitration Association, and copies shall be filed with the Construction Manager and Architect.

§ 4.9.3 Contract Performance During Arbitration. During arbitration proceedings, the Owner and Contractor shall comply with Section 4.7.4.

§ 4.9.4 When Arbitration May Be Demanded. Demand for arbitration of any Claim may not be made until the earlier of (1) the date on which the Architect has rendered a final written decision on the Claim, (2) the tenth day after the parties have presented evidence to the Architect or have been given reasonable opportunity to do so, if the Architect has not rendered a final written decision by that date, or (3) any of the five events described in Section 4.7.2.

§ 4.9.4.1 When a written decision of the Architect states that (1) the decision is final but subject to arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

§ 4.9.4.2 A demand for arbitration shall be made within the time limits specified in Sections 4.9.1 and 4.9.4 and Section 4.9.4.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Section 13.7.

§ 4.9.5 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation or joinder or in any other manner, the Construction Manager, the Architect, or the Construction Manager's or Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Construction Manager, Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, other Contractors as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No persons or entities other than the Owner, Contractor or other Contractors as defined in Section 3.1.2 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a dispute not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 4.9.6 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

§ 4.9.7 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or subcontractors of other Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish

materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Construction Manager will promptly reply to the Contractor in writing stating whether or not the Owner, Construction Manager or Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Construction Manager to reply promptly shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such change.

§ 5.3 SUBCONTRACTUAL RELATIONS

§ 5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

§ 5.4.2 If the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION WITH OWN FORCES AND TO AWARD OTHER CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, which include persons or entities under separate contracts not administered by the Construction Manager. The Owner further reserves the right to award other contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in this Article 6 and in Articles 3, 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner's own forces, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's own forces or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.

§ 6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed construction or partially completed construction or to property of the Owner or other Contractors as provided in Section 10.2.5.

§ 6.2.5 Claims and other disputes and matters in question between the Contractor and other Contractors shall be subject to the provisions of Section 4.7 provided the other Contractors have reciprocal obligations.

§ 6.2.6 The Owner and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

§ 6.3.1 If a dispute arises among the Contractor, other Contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Section 3.15, the Owner may clean up and allocate the cost among those responsible as the Construction Manager, in consultation with the Architect, determines to be just.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 CHANGES

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor; a Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect and Contractor, stating their agreement upon all of the following:

- .1 a change in the Work;
- .2 the amount of the adjustment in the Contract Sum, if any; and
- .3 the extent of the adjustment in the Contract Time, if any.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Section 7.3.3.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 as provided in Section 7.3.6.

§ 7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager and Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Construction Manager on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.6 shall be limited to the following:

- .1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

- .4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.7 Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.8 If the Owner and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Construction Manager for determination.

§ 7.3.9 When the Owner and Contractor agree with the determination made by the Construction Manager concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately issued through the Construction Manager and shall be recorded by preparation and execution of an appropriate Change Order.

§ 7.4 MINOR CHANGES IN THE WORK

§ 7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order issued through the Construction Manager and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner's own forces, Construction Manager, Architect, any of the other Contractors or an employee of any of them, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending arbitration, or by other causes which

the Architect, based on the recommendation of the Construction Manager, determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Section 4.7.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

§ 9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect, through the Construction Manager, a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment for Work completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner, Construction Manager or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents.

§ 9.3.1.1 Such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

§ 9.3.1.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Construction Manager will assemble a Project Application for Payment by combining the Contractor's applications with similar applications for progress payments from other Contractors and, after certifying the amounts due on such applications, forward them to the Architect within seven days.

§ 9.4.2 Within seven days after the Architect's receipt of the Project Application for Payment, the Construction Manager and Architect will either issue to the Owner a Project Certificate for Payment, with a copy to the Contractor, for such amount as the Construction Manager and Architect determine is properly due, or notify the Contractor and Owner in writing of the Construction Manager's and Architect's reasons for withholding certification

in whole or in part as provided in Section 9.5.1. Such notification will be forwarded to the Contractor by the Construction Manager.

§ 9.4.3 The issuance of a separate Certificate for Payment or a Project Certificate for Payment will constitute representations made separately by the Construction Manager and Architect to the Owner, based on their individual observations at the site and the data comprising the Application for Payment submitted by the Contractor, that the Work has progressed to the point indicated and that, to the best of the Construction Manager's and Architect's knowledge, information and belief, quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the Construction Manager or Architect. The issuance of a separate Certificate for Payment or a Project Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a separate Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Construction Manager or Architect may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager or Architect will notify the Contractor and Owner as provided in Section 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Construction Manager and Architect will promptly issue a Certificate for Payment for the amount for which the Construction Manager and Architect are able to make such representations to the Owner. The Construction Manager or Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss because of:

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or another contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 persistent failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Construction Manager and Architect have issued a Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 Neither the Owner, Construction Manager nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

§ 9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.7 FAILURE OF PAYMENT

§ 9.7.1 If, through no fault of the Contractor, 1) the Construction Manager and Architect do not issue a Project Certificate for Payment within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment or 2) the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Construction Manager and Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be accomplished as provided in Article 7.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. The Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

§ 9.8.3 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Construction Manager and Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.11 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments,

retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager will forward the notice and Application to the Architect who will promptly make such inspection. When the Architect, based on the recommendation of the Construction Manager, finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in said final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The making of final payment shall constitute a waiver of Claims by the Owner as provided in Section 4.7.5.

§ 9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment. Such waivers shall be in addition to the waiver described in Section 4.7.5.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

§ 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors.

§ 10.1.2 In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner, Construction Manager and Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner and Contractor, or in accordance with final determination by the Architect on which arbitration has not been demanded, or by arbitration under Article 4.

§ 10.1.3 The Contractor shall not be required pursuant to Article 7 to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB).

§ 10.1.4 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Owner, anyone directly or indirectly employed by the Owner or anyone for whose acts the Owner may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 10.1.4.

§ 10.1.5 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner, Construction Manager and Architect in writing. The Owner, Contractor, Construction Manager and Architect shall then proceed in the same manner described in Section 10.1.2.

§ 10.1.6 The Owner shall be responsible for obtaining the services of a licensed laboratory to verify a presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

- .1 employees on the Work and other persons who may be affected thereby;

- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors;
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
- .4 construction or operations by the Owner or other Contractors.

§ 10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use for storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4, except damage or loss attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

§ 10.3 EMERGENCIES

§ 10.3.1 In an emergency affecting safety or persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Section 4.7 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

- .5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Section 9.10.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

§ 11.2 OWNER'S LIABILITY INSURANCE

§ 11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

§ 11.3.1.1 Property insurance shall be on an "all-risk" policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires minimum deductibles and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles above the amounts so identified or if the Owner elects to purchase this

insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles.

§ 11.3.1.4 Unless otherwise provided in the Contract Documents, this property insurance shall cover portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also portions of the Work in transit.

§ 11.3.1.5 The insurance required by this Section 11.3 is not intended to cover machinery, tools or equipment owned or rented by the Contractor which are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment which shall be subject to the provisions of Section 11.3.7.

§ 11.3.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other perils covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 Waivers of Subrogation. The Owner and Contractor waive all rights against each other and against the Construction Manager, Architect, Owner's other Contractors and own forces described in Article 6, if any, and the subcontractors, sub-subcontractors, consultants, agents and employees of any of them, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, Owner's separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of

insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Section 4.9. If after such loss no other special agreement is made, replacement of damaged property shall be covered by appropriate Change Order.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection be made, arbitrators shall be chosen as provided in Section 4.9. The Owner as fiduciary shall, in that case, make settlement with insurers in accordance with directions of such arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

§ 11.3.11 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by either, be uncovered for their observation and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered which the Construction Manager or Architect has not specifically requested to observe prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or one of the other Contractors in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby.

§ 12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This period of one year shall be extended with respect to portions of Work first performed after Substantial

Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation under this Section 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

§ 12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect issued through the Construction Manager, the Owner may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner may upon ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

§ 12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or other Contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

§ 12.2.6 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

§ 12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

§ 13.1.1 The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.3 WRITTEN NOTICE

§ 13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Construction Manager, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so the Construction Manager and Architect may observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

§ 13.5.2 If the Construction Manager, Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so the Construction Manager and Architect may observe such procedures. The Owner shall bear such costs except as provided in Section 13.5.3.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.5.5 If the Construction Manager or Architect is to observe tests, inspections or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

§ 13.6.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

§ 13.7.1 As between the Owner and Contractor:

- .1 Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
- .2 Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and
- .3 After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to

run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any warranty provided under Section 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Section 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contract may terminate the Contract if the Work is stopped for a period of 30 days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:

- .1 issuance of an order of a court or other public authority having jurisdiction;
- .2 an act of government, such as a declaration of national emergency, making material unavailable;
- .3 because the Construction Manager or Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.2, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents;
- .4 if repeated suspensions, delays or interruptions by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less; or
- .5 the Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

§ 14.1.3 If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.2.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor:

- .1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 accept assignment of subcontracts pursuant to Section 5.4; and
- .3 finish the Work by whatever reasonable method the Owner may deem expedient.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Architect after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 An adjustment shall be made for increases in the cost of performance of the Contract, including profit on the increased cost of performance, caused by suspension, delay or interruption. No adjustment shall be made to the extent:

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.3.3 Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.