



ELECTRICAL SERVICE EVALUATIONS

/ BOILER REPLACEMENTS

Clarkstown Central
School District

June 2015

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A. INTRODUCTION

Clarkstown Central School District directed CSArch to evaluate main electric service equipment at 16 facilities and provide scope and estimate recommendations for boiler replacements at four schools.

B. APPROACH

Building walkthroughs were conducted at each facility with the purpose of investigating the current condition of the electrical service and main distribution panels at each facility. After field observations were performed, existing available drawings from previous projects were reviewed to verify our findings and obtain a better understanding of the actual conditions and age of the electrical equipment at each building. This information was utilized to prepare this report which details the existing conditions and includes recommendations and proposed scope of work.

C. ELECTRICAL SERVICE RECOMMENDATIONS

Building	Equipment Vintage	Estimated Service Life (Years)	Actual Service Life (Years)	Upgrade Recommended
North High School	1959	30	56	Yes
South High School	1970	30	45	Yes
Felix Festa Middle School	1967	30	48	Yes
Bardonia Elementary School	2006	30	9	
Lakewood Elementary School	1967	30	48	Yes
Laurel Plains Elementary School	1962	30	53	Yes
Link Elementary School	1964	30	51	Yes
Little Tor Elementary School	1961	30	54	Yes
New City Elementary School	2006	30	9	
Strawtown Elementary School	1971	30	44	Yes
West Nyack Elementary School	1957	30	58	Yes
Woodglen Elementary School	1967	30	48	Yes
Birchwood Elementary School	1964	30	51	Yes
Congers Elementary School	2005	30	10	
Chestnut Grove School	1995	30	20	
Bus Garage	1993	30	22	

D. BOILER REPLACEMENTS

Building	Equipment Vintage	Estimated Service Life	Actual Service Life	Upgrade Recommended
North High School	1953	30	62	Yes
South High School	1970	25	45	Yes
Felix Festa Middle School	1967	25	48	Yes
Birchwood Elementary School	1964	25	51	Yes

A. NORTH HIGH SCHOOL**Description of Existing Service**

The existing utility at High School North originates at a utility pole and proceeds to go underground with medium voltage 9KV cable and continues to the high school Annex section. Inside the building the medium voltage cable is routed through exposed conduit to the main gear location where the main distribution gear is located.

The main distribution switchboard at High School North appears to be from the original building construction in 1958, with some component modifications such as the fuses and transformer being replaced within the last five years. The main gear consists of two 600A medium-voltage fused disconnect sections, a third section with multiple circuit breakers and a transformer section. One of the two disconnects feeds the transformer located in one of the adjacent sections while the other, feeds an outdoor pad mounted transformer which feeds the Main Building. The existing configuration of the main electrical service to the building currently routes medium voltage conductors in exposed conduit inside of the building for a distance greater than 10' before reaching disconnecting means. The described routing represents a dangerous condition for the school.

The electrical distribution for the Main Building originates at the second fuse and is routed underground to feed an exterior pad mounted transformer. This transformer is a 208/120V secondary (pending verification) dry type transformer and feeds a main distribution 208/120V, 3-Phase, 4-Wire, 1600A ITE switchboard. The switchboard, per the name plate, was installed in December 1985, making this gear almost 30 years old.



Main Service Conduit



Main Service Pole

Main Electrical Service Condition

The utility pole does not have any noticeable damage. The pole seems in acceptable condition.

Assuming the primary underground cables to the school are from the original construction, (this would mean they are approximately fifty-five (55) years old), these cables are past its useful life. Furthermore as previously described, the medium voltage conductors routing inside of the building represent a safety hazard.

The switchboard in the main electrical room of the Annex, even though it has been modified, overall is past its useful life and should be replaced. The fuses inside appear to be in good condition, however the bus, and conductors, and circuit breaker section do not appear to have been replaced.

The second switchboard located in the Main Building electrical room, is from 1985 and currently has three sections, with a fourth section previously removed. The breaker section has exposed conduits which creates a dangerous condition. A second section is covered with a door, but when opened, exposed cables are visible in this section. This is another unsafe condition. Due to the age of the board, and the noticeable missing parts, the switchboard is not in an acceptable condition and should be replaced.

The outdoor pad mounted transformer feeding the second switchboard appears to be in acceptable condition. The transformer was installed within the last ten (10) years and does not appear to have sustained any damage.

Service Capacity

The peak usage for 2013-2014 was 370KW, in May, 2013. Based on the 1958 plans, the high school service appears to be 1000KVA. Per this service size, the recorded peak load represents approximately 37% of the total capacity. Note: The exact service capacity provided to the building shall be verified.



Second Distribution Switchboard Section



Fused Disconnects at Switchboard

Recommendations

Replace the indoor primary switchboard, located in the Annex main electrical room, with an exterior, custom made pad mount three section switchboard. The new switchboard shall be made to accept the existing transformer in one section. The existing service transformer shall be salvaged and re-installed in the proposed exterior switchboard. Existing fuses shall be turned over to owner.

A second switchboard section shall be provided with two (2) service-rated medium voltage 600A disconnects. One disconnect shall feed the transformer in the switchgear, while the second disconnect shall feed the pad mounted transformer that feeds the Main Building.

Replace the underground medium voltage primary feeders from the utility pole to proposed new exterior gear. Presence of medium voltage primary conductors inside the school represents a potential safety hazard; therefore the replacement underground primary conductors shall terminate at the exterior switchboard.

Replace underground medium voltage primary feeders from the exterior switchboard to the existing pad mounted transformer.

The existing distribution panel located in the third section of the existing switchgear shall be removed. A new 480V Distribution Panel (800A, 480V, 3-Phase, 4-Wire) shall be provided in the main electrical room.

The main distribution panelboard at the Main Building is in poor condition and should be replaced with a 1200A, 208/120V, 3-Phase, 4-Wire, three-section switchgear.

Refer to Figure A below for electrical service modifications.

Project Scope:

- Coordinate with utility company for disconnection and reconnection of the primary feed to the school.
- Remove existing switchboard at the Annex main electrical room and salvage existing transformer for relocation.
- Replace main electrical room switchboard with (800A/480V) main distribution panelboard.
- Replace Main Building switchboard. Maintain exterior pad mounted transformer and secondary feeders.
- Provide outdoor, service entrance rated main service medium voltage switchgear with two 600A disconnects and transformer section to house existing Annex main electrical room transformer.
- Replace medium voltage feeders from proposed new exterior gear to existing Main Building pad mounted transformer.
- Provide secondary feeders from exterior switchgear to Annex main electrical room MDP.

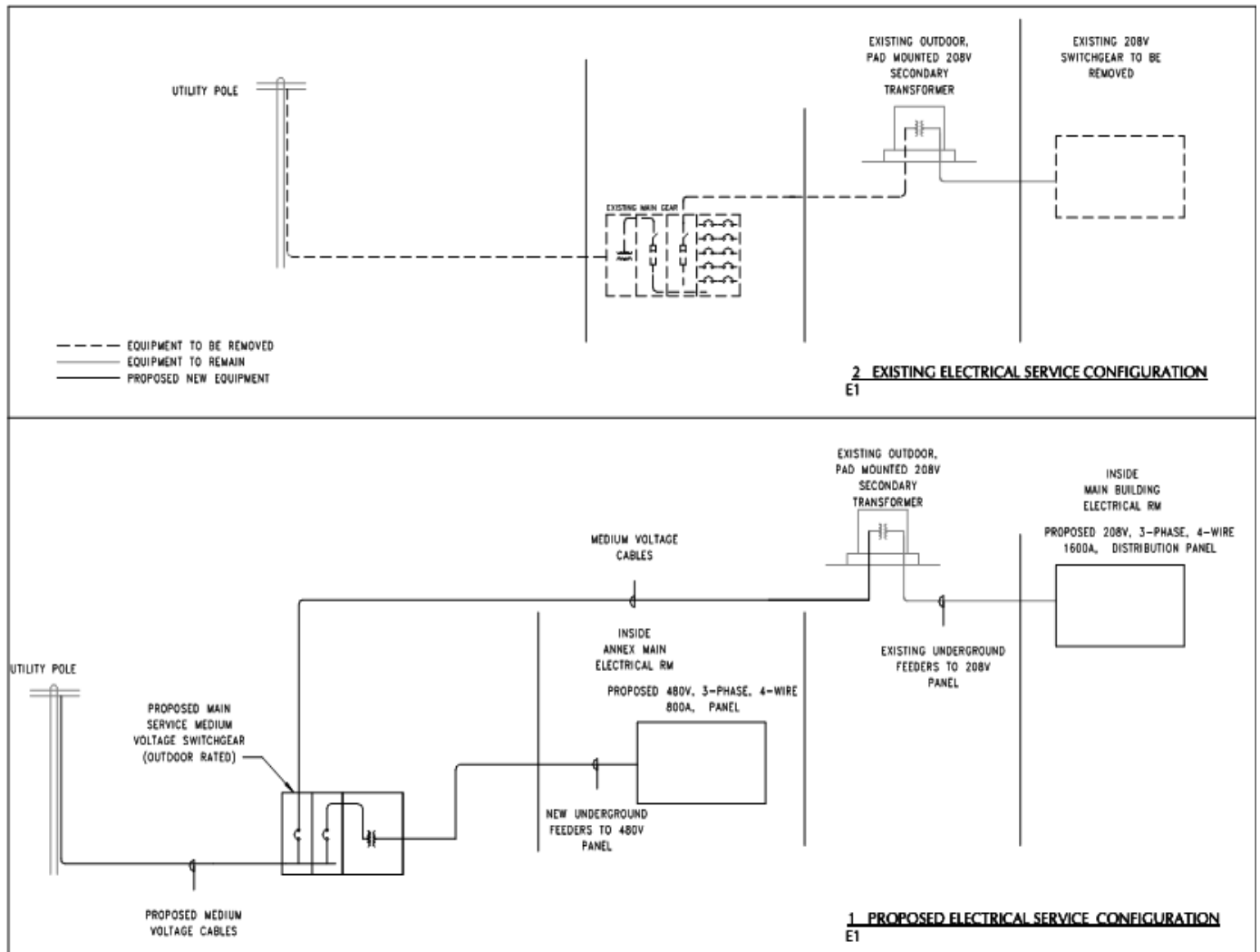


Figure A - North High School Electrical Service

B. SOUTH HIGH SCHOOL**Description of Existing Service**

As per drawing E-21 of the 1969 original drawings and as verified with field observations, the electrical service at High School South comes to a 480/277V, 3-Phase, 4-Wire 4000A Zinsco electrical switchboard. The service originates from a utility pad mounted transformer located approximately 100' from the north side of the building. The utility meter is located further out, near the entrance to the driveway leading to the school. At this location, a utility pole is also located and is where conductors go underground to continue to transformer location. The switchboard contains several fused disconnects for branch and distribution panels throughout the school.

Main Electrical Service Condition

The utility pad mounted transformer appears to be from the original construction. The transformer seems to be in satisfactory condition, although it is nearing the end of its useful life. At the time of the survey, it was not possible to verify if the associated primary underground conduit and secondary conduit to the school were from the original construction. At this time it will be assumed that they are.

The existing main switchboard at this school is a Zinsco type board from the original building construction. Zinsco electrical equipment is considered obsolete, due to a design flaw in which the circuit breaker connection to the bus bar becomes loose, causing arcing and subsequent overheating. This switchboard is past its useful life.

Assuming that the existing main feeders to the main panel are from the original building construction, the feeders would be approximate fifty 50 years old.

The utility pole near the entry drive way to the school has several tree branches near the conductors and fuse connections. This is a safety hazard because these branches may cause undesired power loss to the entire building and possibly a fire.



Main Distribution Switchboard



Service Pole

Service Capacity

The existing 4000A switchboard provides 3,200A or 2,394KW of available capacity. The peak usage for 2013-2014 was 525KW, this occurred in three different occasions. The recorded peak load represents an approximate 22% of the total capacity that the 4000A switchboard provides.



Pad Mounted Transformer

Recommendations

Based on the assumption that the utility transformer is from the original construction, fifty years ago, a transformer replacement with a more efficient transformer is recommended. Furthermore, the existing peak demand usage shows that the existing service may be oversized for the current energy use at the school. A complete utility service renovation, with new utility transformer, utility meter, secondary conduit and wires into the building and new switchboard is recommended. As per the original drawings, a spare conduit was installed from the primary manhole to the transformer, hence only the primary conduit from the main pole to the primary manhole would be required. The proposed new service shall be for a 1,500KVA transformer with a 480/277V, 3-Phase, 4-Wire, 3000A rated 2500A main disconnect service rated switchboard.

The existing trees near the utility pole represent a safety hazard for the school. Tree branches shall be trimmed to allow for clear space for utility pole and conductors.

Even though aftermarket replacements for the Zinsco breakers are available, considering that this switchboard is past its useful life and its noted possible safety hazard, it may be more cost effective simply to replace the entire panel with a more modern and safer design from another manufacturer (such as Eaton, GE, Siemens, or Square-D), depending on the number of breakers to be replaced.

Project Scope:

- Coordinate with utility company for removal of existing transformer, existing primary cables.
- Removal of primary conduit, secondary cables and conduit and existing switchboard.
- Coordinate with utility company to provide pad mounted 1500KVA, 480/277V secondary transformer. Provide all primary conduit and secondary conduit and conductors to switchboard inside of building.
- Provide 480/277V, 3-Phase, 4-Wire, 3000A rated, 2500A Main disconnect, service entrance rated Main Distribution switchboard and CT cabinet.

C. FELIX FESTA MIDDLE SCHOOL**Description of Existing Service**

As per drawing E-2 of the 2003 drawings and as verified with field observations, the electrical service at Felix Festa Middle School is split into three separate services. The main service begins as an underground service with metering at island meter station near utility pole. Underground main feeds an outdoor primary fuse box which in turn feeds through to the transformers servicing 'Building B' and a 15kV fused switch servicing the 'Natatorium Building' and 'Building E'. Figure 1 below shows the exterior meter. Figure 2 below shows the primary fuse box.



Building Meter



Primary Fuse Box

'Building B' is fed from a 500kVA 13.2kV – 408/277V transformer. The feed is split, separately feeding a 800A disconnect and a 400A 'DP1' panel. The 800A disconnects feeds into a switchgear with an integrated transformer for distribution at 480/277V and 208/120V. Figure 3 below shows Building 'B's transformer. Figure 4 below shows Building 'B's main distribution panel.



Building 'B' Transformer



Building 'B' Main Distribution Panel

The 'Natatorium' Building is fed from a 15kV switch to a 750kVA, 13.2kV-480/277V transformer. It feeds directly into a new 1200A distribution panel. Figure 5 below shows the 'Natatorium' Building's service disconnect.



Natatorium's Service Disconnect

Building 'E' is fed from a 15kV switch to an integrated 500kVA, 13.2kV-480/277V transformer located inside of the switchgear. The old switchgear has a second integrated transformer for distribution at 480/277V and 208/120V.



Building 'E' Main Distribution Panel

Main Electrical Service Condition

The meter and primary fuse both originate from construction in the 2000s and are in good condition. The pad mounted transformer feeding Building 'B' was also installed at this time.

The existing main distribution panel at Building 'B' appears to be a mix of equipment left over from the original building construction and new equipment installed during the 2000s project. The remaining main distribution panel equipment includes; 208/120V transformer, 800A 480/277V panelboard, and a 600A 208/120V panelboard. The equipment is 30+ years old and beyond its expect service life.

The 'Natatorium' equipment, both the transformer and main distribution panel, were installed in the 2000s and are in good condition.

The existing main distribution panel at Building 'E' appears to be equipment from the original building construction. The Main Distribution equipment includes an interior 13.5kV-480/277V transformer, main building fused disconnect, 800A 480/277V panelboard, 480V – 208/120V transformer, and 600A 208/120V panelboard. The equipment is 40+ years old and is beyond its expected service life.

Service Capacity

Peak usage for 2013-2014 was 740kW in September. This represents an approximate 63% total usage of the three main building transformers.

Recommendations

A utility upgrade and rewiring has been completed within the last 15 years. It is not recommended that any upgrades or replacements to the utility occur at this time.

Considering the current state of the original Building 'B's main distribution, it is recommended that the remainder of the old equipment be removed and replaced. The secondary feeder may be reused and terminated in a new 800A, 480/277V, 3-Phase, 4-Wire Main Distribution Panelboard. A dry-type 150kVA 480-208/120V transformer should be provided to replace the existing transformer in the existing switchgear, as well as a new 600A, 208/120V, 3-Phase, 4-Wire Main Distribution Panelboard.

The 'Natatorium' distribution is in good condition and no upgrades are recommended at this time.

Building 'E's main distribution is nearing the end of its expected service life and should be replaced. A new pad mounted transformer outside the building should be provided, along with an 800A, 480/277V, 3-Phase, 4-Wire Main Distribution Panelboard. A dry-type 150kVA 480-208/120V transformer should be provided to replace the existing transformer in the existing switchgear, as well as a new 600A, 208/120V, 3-Phase, 4-Wire Main Distribution Panelboard.

Project Scope:

- Provide 480/277V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel.
- Provide dry-type 150kVA 480-208/120V transformer.
- Provide 208/120V, 3-Phase, 4-Wire, 600A MCB service entrance rated Main Distribution panel.
- Intercept primary wire and provide pad mounted 300kVA 13.5kV-480/277V transformer. Provide secondary conduit and wiring to new main distribution panel.
- Provide 480/277V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel.
- Provide dry-type 150kVA 480-208/120V transformer
- Provide 208/120V, 3-Phase, 4-Wire, 600A MCB service entrance rated Main Distribution panel.

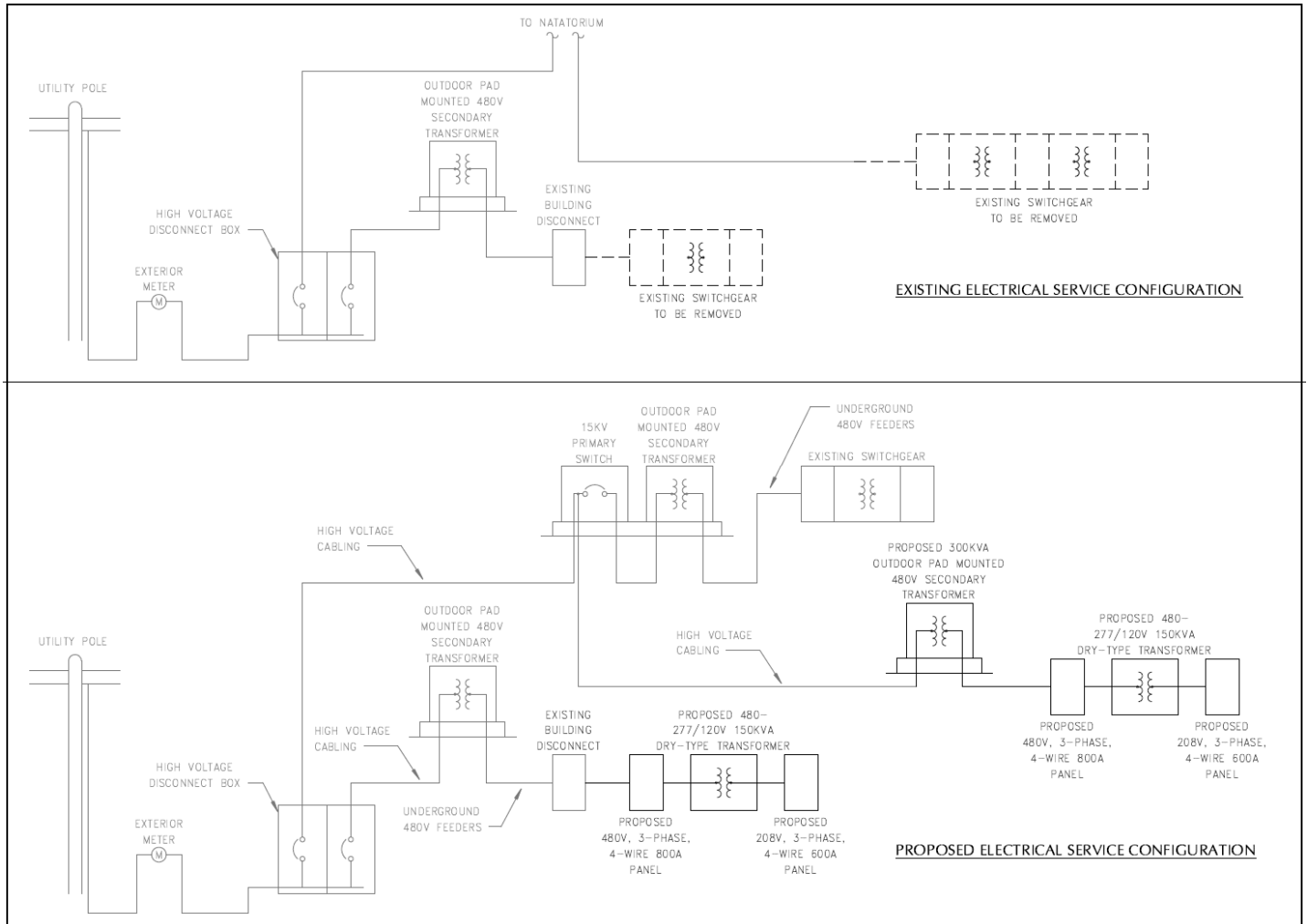


Figure B - Felix Festa Middle School Electrical Service

D. BARDONIA ELEMENTARY SCHOOL**Description of Existing Service**

The electrical service at Bordonia Elementary is a 208/120V, 3-Phase, 4-Wire 600A service. It originates from an underground utility service with metering at island meter station near the utility pole. The service enters the building at a 600A main disconnect switch located in the basement level in the Boiler room. The main disconnect feeds a wireway where multiple disconnects and panels are connected.



Main Disconnect, wireway and branch panels.

Main Electrical Service Condition

The existing main disconnect switch and distribution panelboard are in good condition. The main disconnect appears to have been installed in 2006.

The working clearance in front of the main disconnect does not comply with the NEC. In front of the panels there are existing pipes and mechanical equipment. When measured, distance between panel and pipes is 2'-6", not the required 3'-0".

Service Capacity

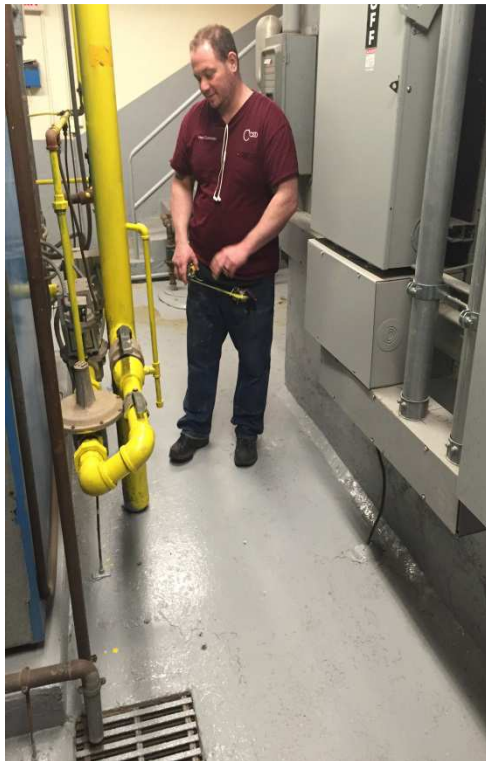
The existing 600A service provides 480A or 156KW of available capacity. The peak usage for 2013-2014 was 82KW in May 2013. The recorded peak load represents an approximate 52% of the total capacity that the 600A service provides.

Recommendations

Current service utility pole and related fuses are in good condition and peak usage does not warrant any upgrade requirements.

Main service disconnect, related panels and conduits are in good condition. No upgrades are recommended at this time for interior electrical distribution main components.

The main service disconnect should be relocated to provide NEC required working clearance. The main service disconnect shall be relocated to the available space on the left side of the disconnect. The associated wireway and disconnect shall be extended to proposed disconnect location.



Main service panels working clearance

Project Scope:

- Relocate existing main service disconnect.

E. LAKEWOOD ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-1 of the 1966 original drawings and as verified with field observations, the electrical service at Lakewood Elementary is a 208/120V, 3-Phase, 4-Wire 800A electrical service. It originates from a utility pole to a 150KVA transformer bank where three (3) 50KVA transformers are located. The service enters the building at the basement level where the 800A Main Distribution Panelboard and meter are located. The main distribution panelboard contains an 800A main circuit breaker and an additional six (6) circuit breakers for branch panels and mechanical equipment.



Main Distribution Panel

Main Electrical Service Condition

The utility transformers are located in a vault inside the building. The transformers appear to be at least 20 years old. Primary conductors and connectors appear to be original.

The existing main distribution panelboard has been replaced and appears to be in good condition.



Main distribution Panel feed

Service Capacity

The existing 150KVA service provides 135KW or 416A of available capacity. The peak usage during the period of 2013-2014 was 77KW in September, 2013. The recorded peak load represents an approximate 57% of the total capacity that the 150KVA the utility service provides.

Recommendations

Utility transformers and related conductors and connectors should be replaced and relocated outside the building. The transformer vault location inside the school presents a potential life safety hazard.

The existing transformers should be removed and replaced with a pad mounted type transformer outside of the building. New secondary conduit and conductors to main distribution panel shall be provided. The recorded demands do not approach the existing service capacity; therefore no increase in the service size to the building is necessary. The existing meter may remain as it is within its usable life.

Recommended Scope:

- Remove the existing transformer bank and all associated conductors inside vault.
- Provide pad mounted 150KVA 208/120V transformer.
- Provide all secondary conduit and wiring to main distribution panel.
- Replace primary cables and conduit from existing overhead service pole.

F. LAUREL PLAINS ELEMENTARY SCHOOL**Description of Existing Service**

The electrical service at Laurel Plains Elementary is a 208/120V, 3-Phase, 4-Wire 800A electrical service circa 1962. It originates from a utility pole to a 150KVA transformer bank composed of three (3) 50KVA transformers located in the transformer vault inside the school. The service from the transformers enters the basement level where an 800A Square D Main Distribution Panelboard and meter are located. The main distribution panelboard contains an 800A main circuit breaker, CT section and an additional six (6) circuit breakers for branch panels. The main distribution panelboard and feeders appear to be from the original building construction.



Main Distribution Panel

Main Electrical Service Condition

The utility transformers located in a vault inside the school and appear to be original to the building. The existing main distribution panelboard is original and well beyond its expected service life. The existing primary and secondary service feeders appear to be original.

Service Capacity

The existing 150KVA service provides 135KW or 416A of available capacity. The peak usage during the period of 2013-2014 was 75KW in September, 2013. The recorded peak load represents an approximate 56% of the total capacity that the 150KVA the utility service provides.

Recommendations

Utility transformers and related conductors and connectors should be replaced and relocated outside the building. The transformer vault location inside the school presents a potential life safety hazard.

The existing transformers should be removed and replaced with a pad mounted type transformer outside of the building. New secondary conduit and conductors to main distribution panelboard shall be provided. The recorded demands do not approach the existing service capacity; therefore no increase in the service size to the building is necessary.

The existing main distribution panelboard is well beyond its expected service life and should be replaced.

Recommended Scope:

- Remove existing transformer bank and all associated conduit and wiring inside vault.
- Install pad mounted 150KVA 208/120V transformer. Provide all secondary conduit and wiring to main distribution panel.
- Replace primary cables and conduit from existing overhead service pole.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panelboard and CT cabinet.

G. LINK ELEMENTARY SCHOOL**Description of Existing Service**

The electrical service at Link Elementary is a 208/120V, 3-Phase, 4-Wire 1200A electrical service circa 1964. It originates from a utility pole to a 300KVA pad-mounted transformer located at the building's exterior. The service from the transformer enters the first floor level where an 800A Square D Main Distribution Panelboard and meter are located. The main distribution panelboard contains a 1200A main circuit breaker, CT section and an additional fourteen (14) circuit breakers for branch panels. The main distribution panelboard and feeders appear to be from the original building construction.



Main Distribution Panel

Main Electrical Service Condition

The utility transformer located at the building's exterior is currently in poor condition and beyond its expected service life. The transformer location should be moved further away from the building to reduce potential hazard in the event of a catastrophic failure.



Utility Transformer

Although some parts have been replaced over the years, the existing main distribution panelboard is well beyond its expected service life and should be replaced.

The existing main feeders also appear to be from the original building construction and should also be replaced.

Service Capacity

The existing 300KVA utility transformer provides 270KW or 833A of available capacity. The peak usage for 2013-2014 was 78KW in September, 2013. The recorded peak load represents an approximate 29% of the total capacity that the utility service provides.

Recommendations

The existing service equipment is beyond its expected service life and should be replaced. The existing transformer should be replaced and moved further from the building. Primary and secondary feeders should be replaced to ensure reliable service. Recorded demands are much lower than the existing service capacity. Therefore a reduction in the service size to the building is recommended.

The existing Main distribution panel as noted is nearing the end of its useful life. A new 800A, 208/120V, 3-Phase, 4-Wire Main Distribution Panel shall be provided to replace the existing panel in kind. The existing CT cabinet is within the switchboard to be removed, therefore a new CT cabinet shall be provided.

Recommended Scope:

- Coordinate with utility company for service disconnection
- Disconnect and remove existing switchboard and associated feeders.
- Provide pad mounted 150KVA 208/120V transformer in new location further from building.
- Provide meter box, and CT cabinet .
- Replace primary conduit and wiring to transformer.
- Replace secondary conduit and wiring from transformer to main distribution panel.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel and CT cabinet.

H. LITTLE TOR ELEMENTARY SCHOOL

Description of Existing Service

The electrical service at Little Tor Elementary is a 208/120V, 3-Phase, 4-Wire 225KVA electrical service. It originates from a utility pole and proceeds to a transformer room in the west corner of the north wing. In the transformer room, the service enters a 500A 1960 vintage four section switchboard. One of the sections contains a 225 kVA transformer. Another section contains a fused disconnect. The disconnect rating could not be determined. The third section of the meter contains several disconnects which feed branch panelboards. In the electrical room there are also several other electrical panels that date back to the 1960s.



Main Distribution Panel



Meter at pole

Main Electrical Service Condition

The switchboard is original and is beyond its expected service life.

The existing utility pole, meter (mounted on pole) primary 5KV cables into the building and owner owned 225KVA transformer (inside gear) all appear to be from original building construction and exhibit noticeable wear and tear.

Service Capacity

The existing 225KVA service provides 203KW or 625A of available capacity. The peak usage for 2013-2014 was 82KW in September, 2013. The recorded peak load represents an approximate 40% of the total capacity that the utility service provides.

Recommendations

The main distribution switchboard is beyond its expected service life and should be replaced. The service should be reconfigured to move the medium voltage transformer to a safe location outside of the school. Existing primary and secondary feeders should also be replaced. The recorded demands do not approach the existing service capacity; therefore no increase in the service size to the building is necessary. The existing meter and CT cabinet should also be replaced.

A new 800A, 208/120V, 3-Phase, 4-Wire Main Distribution Panelboard shall be provided to replace the existing panel in kind. The existing CT cabinet is within the switchboard to be removed, therefore a new CT cabinet shall be provided.

The existing branch panels (assume 4) in the electrical room are also beyond their expected service life. Replacement of branch panels in electrical room is recommended in an effort to clear space and provide ample working space around new MDP.

Recommended Scope:

- Coordinate with utility company for service disconnection and removal of existing meter and CT cabinet.
- Disconnect and remove existing switchboard and associated feeders.
- Provide pad mounted 225KVA 208/120V transformer.
- Provide meter box, and CT cabinet.
- Provide all primary conduit and wiring to transformer.
- Provide secondary conduit and wiring from transformer to main distribution panelboard.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel and CT cabinet.
- Replace adjacent branch circuit panelboards in an effort to provide proper working clearances in electrical room.

I. NEW CITY ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-502 of the 2005 renovations and verified with field observations, the electrical service at New City Elementary is a 208/120V, 3-Phase, 4-Wire 600A electrical service. It originates from a utility pole and goes underground to the basement location where the meter, CT cabinet, main service disconnect and main distribution panel are located. The main distribution panelboard is a Siemens type S4 panel with a sticker date of 11/30/01. The panel is a two section main lugs only panel with no main disconnect and a total of eighty-four (84) circuit breakers. The breakers feed the branch panelboards as well as mechanical equipment. The existing meter has a yellow sticker with a "Removed" date of 08/22/01. Figure 1 below shows the main disconnect, meter and CT cabinet configuration.



Main Disconnect

Existing Service Condition

The existing main distribution panel at this school is in satisfactory condition. There is no noticeable damage to the panel and conduits appear to be in acceptable condition.

The meter also appears to be from the 2001 time frame. As previously mentioned, it has a sticker with a 2001 date, the meter condition is acceptable and an upgrade for this device is not necessary for this equipment at this time.

The CT cabinet however, appears to have been installed prior to the 2001 date. The condition of the cabinet is acceptable at the moment, but replacement should be considered in the near future (within 5-10 years).

Service Capacity

The existing 600A service provides 480A or 156KW of available capacity. The peak usage for 2013-2014 was 92KW in September, 2013. The recorded peak load represents an approximate 59% of the total capacity that the 600A service provides.

Recommendations

Current service utility pole and related transformer are in acceptable condition and peak usage does not warrant any upgrade requirements. Meter is also within its usable life.

CT cabinet although older than the meter and panel, does not require replacement. Coordination with utility company to determine exact age of CT cabinet will aid in the recommendation to replace the CT cabinet and associated equipment.

Main service disconnect, main distribution panel and related feeders are in acceptable condition. No upgrades are necessary at this time for interior electrical distribution main components.

J. STRAWTOWN ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-1 of the 1970 original drawings and verified with field observations, the electrical service at Strawtown Elementary is a 208/120V, 3-Phase, 4-Wire 800A electrical service. The service originates at a utility pole with underground primary feeders to a pad mounted 150kVA transformer. The service enters the building to the first floor level where the 800A Main Distribution Panelboard and meter are located. The main distribution panelboard contains an 800A main circuit breaker and an additional twelve (12) circuit breakers for branch panels and mechanical equipment.



Main Distribution Panel

Main Electrical Service Conditions

The utility transformer is located on a pad at the exterior side the building. It appears to be from the original building construction. The transformer has suffered damage and decay over its 40+ years of operation.

The existing main distribution panel at this school appears to be from the original building construction and is beyond its expected service life.

The existing main feeders to the panel appear to have been replaced at some point from the original building construction. The feeders exit the room where the panel is located and directly feed into the transformer outside.



Utility Transformer

Service Capacity

The existing 150KVA service provides 135KW or 416A of available capacity. The peak usage for 2013-2014 was 91kW in September, 2013. The recorded peak load represents an approximate 67% total usage of the main building transformer.

Recommendations

Considering that the current service utility transformer is of considerable age and is damaged, a utility upgrade is recommended. The existing transformer shall be removed and replaced with a pad mounted type transformer outside the building at the same location. New secondary feeders to the main distribution panel shall be provided. The recorded demands do not approach the existing service capacity; therefore no increase in the service size to the building is necessary. The existing meter may remain as it is within its usable life.

The existing Main Distribution Panel as noted is nearing or at the end of its useful life. A new 800A, 208/120V, 3-Phase, 4-Wire Main Distribution Panel shall be provided to replace the existing panel in kind.

Recommended Scope:

- Replace existing pad mounted transformer and primary feeders.
- Disconnect and remove existing Main Distribution Panel and associated feeders.
- Provide pad mounted 150kVA 208/120V transformer.
- Replace secondary feeder to main distribution panel.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution Panel.

K. WEST NYACK ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-1 of the 1956 original drawings and verified with field observations, the electrical service is a 208/120V, 3-Phase, 4-Wire 600A. The service originates from a utility pole to a 150KVA transformer bank where three (3) 50KVA transformers are located. The service comes into the building to the basement level where the 500A Main Distribution Panel and meter are located. The service is split at a 600A main disconnect switch to the 500A Main Distribution Panel, two (2) 150A disconnects, and one (1) 200A disconnect. The main distribution panel contains an additional eighteen (18) circuit breakers for branch panels and mechanical equipment.



Main Distribution Panel and Main Disconnect Switch

Main Electrical Service Conditions

The utility transformers located in a vault on the exterior side of the building do not appear to be from the original building construction, although some of the conductors and connectors appear to be. Although the transformers do not appear to be from the original construction, they do appear to be in use for 20+ years.

The existing main distribution panel at this school does not appear to be from the original building construction; however the breakers appear to be greater than 20 years old and nearing the end of its useful life.

The existing main feeders to the panel may be from the original building construction. The feeders come through the wall to a hinged wireway, refer figure 2 below.



Main Disconnect Feeders

Service Capacity

The existing 150KVA service provides 135KW or 416A of available capacity. The peak usage for 2013-2014 was 98kW in September, 2013. The recorded peak load represents an approximate 73% total usage of the main building transformers.

Recommendations

Utility service upgrade is recommended due to the age and condition of the transformer. The location of the transformer in a vault connected to the building poses a potential life safety hazard in the event of a catastrophic failure. Existing service capacity appears to be adequate.

The existing main distribution panel is well beyond the expected service life and should be replaced with an 800A, 208/120V, 3-phase, 4-wire service rated main distribution panelboard. The 'split' for the 150A and 200A disconnects shall be removed and consolidated into the main panel.

Recommended Scope:

- Remove existing transformer bank and all associated conduit and wiring inside vault.
- Provide pad mounted 150KVA 208/120V transformer. Provide all secondary conduit and wiring to main distribution panel.
- Provide underground primary conduit and cable to utility service pole for connection to existing overhead utility service.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel.

L. WOODGLEN ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-1 of the 1966 original drawings and as verified with field observations, the electrical service at Woodglen Elementary is a 208/120V, 3-Phase, 4-Wire 800A electrical service. It originates from a utility pole to a 150KVA transformer bank composed of three (3) 50KVA transformers located in the transformer vault which is a room connected to the main building. The service from the transformers comes into the basement level where an 800A Federal Pacific Main Distribution Panel and meter are located. The main distribution panel contains an 800A main circuit breaker, CT section and an additional six (6) circuit breakers for branch panels. The main distribution panel and feeders appear to be from the original building construction. Refer to Figure 1 and Figure 2 below for the main distribution panel and transformer bank configuration.

There are two water pipes in the space above the main electrical switchboard. This is a safety hazard, and damage to the panel may occur if leaking or breaks lead to water pouring down to the switchboard.



Main Distribution Panel



Utility Transformers in Vault



Pipes above Switchboard

Main Electrical Service Condition

The utility transformers located in a vault connected to the building do not appear to be from the original building construction, nonetheless some of the conductors and connectors appear to be. Even though the transformers do not appear to be from the original construction, they do appear to be in use for 20+ years.

The existing main distribution panel at this school appears to be from the early stages of the original building construction, which dates back to 1960s. Federal Pacific electrical distribution equipment are outdated and finding replacement parts for them is difficult. This gear is past its useful life and should be replaced.

The existing main feeders to the panel also appear to be from the original building construction. The feeders come thru the wall directly to the main gear.

Service Capacity

The existing 150KVA service provides 135KW or 416A of available capacity. The peak usage for 2013-2014 was 75KW in September, 2013. The recorded peak load represents an approximate 56% of the total capacity that the utility service provides.

Recommendations

Considering that the current service utility transformer are of considerable age, and the transformer vault is connected to the school, which represents a possible safety hazard; a utility service upgrade is recommended. The existing transformers shall be removed and replaced with a pad mounted transformer outside of the building. New secondary conduit and conductors to main distribution panel shall be provided. The recorded demands do not approach the existing service capacity; therefore no

increase in the service size to the building is necessary. The existing meter may remain as it is within its usable life.

The existing Main distribution panel as noted is nearing the end of its useful life. A new 800A, 208/120V, 3-Phase, 4-Wire Main Distribution Panel shall be provided to replace the existing panel in kind. A proper drip pan shall be provided above electrical equipment located under water pipes. The existing CT cabinet is within the switchboard to be removed, therefore a new CT cabinet shall be provided with connections by utility company.

Recommended Scope:

- Coordinate with utility company for removal of existing transformer bank and all associated conduit and wiring inside vault.
- Provide pad mounted 150KVA 208/120V transformer.
- Provide all secondary conduit and wiring to main distribution panel.
- Replace primary feeder.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel and CT cabinet.
- Relocate piping located above electrical equipment.

M. BIRCHWOOD ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-1 of the 1963 original drawings and verified with field observations, the electrical service at Birchwood Elementary is a 208/120V, 3-Phase, 4-Wire 800A electrical service. It originates from a utility pole to a pad mounted 150kVA transformer located at the building's exterior. The service comes into the building to the first floor level where the 800A Main Distribution Panel and meter are located. The main distribution panel contains an 800A main circuit breaker and an additional six (6) circuit breakers for branch panels and mechanical equipment.



Main Distribution Panel

Main Electrical Service Condition

The utility transformer is located on a pad at the exterior side the building. It appears to be from the original building construction. The transformer is in good condition, but has been in operation for 40+ years. Figure 2 below shows the transformer.

The main distribution panel at this school does not appear to be from the original building construction; however the breakers appear to be greater than 20 years old and nearing the end of its useful life. The existing panel has a main circuit breaker, and as suggested, does not appear to date back to the 1960s.

The existing main feeders to the panel appear to have been replaced at some point from the original building construction. The feeders exit the room where the panel is located and directly feed into the transformer outside.



Pad Mounted Transformer

Service Capacity

The existing 150KVA service provides 135KW or 416A of available capacity. The peak usage for 2013-2014 was 56kW in June. The recorded peak load represents an approximate 41% total usage of the main building transformers.

Recommendations

Considering that the current service utility transformer is of considerable age a utility service upgrade is recommended. The existing transformer shall be removed and replaced in kind with a pad mounted type transformer outside of the building. New secondary conduit and conductors to main distribution panel shall be provided. The recorded demands do not approach the existing service capacity; therefore no increase in the service size to the building is necessary. The existing meter may remain as it is within its usable life.

The existing Main distribution panel as noted is nearing the end of its useful life. A new 800A, 208/120V, 3-Phase, 4-Wire Main Distribution Panel shall be provided to replace the existing panel in kind.

Recommended Scope:

- Remove existing transformer.
- Provide pad mounted 150KVA 208/120V transformer.
- Replace all secondary conduit and wiring to main distribution panel.
- Provide 208/120V, 3-Phase, 4-Wire, 800A MCB service entrance rated Main Distribution panel.

N. CONGERS ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing ECM-7-E-4 of the 2004 renovations and verified with field observations, the electrical service at Congers Elementary is a 208/120V, 3-Phase, 4-Wire 1200A electrical service. It originates from a utility pole to a pad mounted 300KVA transformer located in the front area of the school. The service comes into the building to the basement level to a CT cabinet, a meter and to a 1200A main lug only distribution panel. The main distribution panel contains four (4) utilized breakers and two (2) spare breakers. The breakers feed the old distribution panel as well as other branch panels which were installed during the time of the renovation.



Main Disconnect, panel.

Main Electrical Service Condition

The existing main distribution panel at this school is satisfactory. The panel was installed after 2004; hence it is still well within its useful life. There is no noticeable damage to the panel and conduits appear to be in acceptable condition.

Service Capacity

The existing 300KVA service provides 270KW or 833A of available capacity. The peak usage for 2013-2014 was 62KW in January 2013. The recorded peak load represents an approximate 23% of the total capacity that the 300KVA service provides. It should be noted however, that the school has been unoccupied during a prolonged period of time. Even so, the expected loads at the school do not warrant for an increase in the utility service capacity to the building.

Recommendations

Current service utility pole and related transformer are in acceptable condition and peak usage does not warrant any upgrade requirements. Meter is also within its usable life.

Main distribution panel, related panels and conduit are in acceptable condition. No upgrades are necessary at this time for interior electrical distribution main components.

O. CHESTNUT GROVE ELEMENTARY SCHOOL**Description of Existing Service**

As per drawing E-9 of the 1995 renovations and verified with field observations, the electrical service at Chestnut Grove is a 208/120V, 3-Phase, 4-Wire 1600A electrical service. (Note: It should be noted, 1995 plans call for a 1200A switchboard). It originates from a utility pole and goes underground to a pad-mounted transformer located outside of the school. From the transformer, the feeders proceed to the basement where the meter, CT cabinet and main service switchboard are located. The main board is a Cutler-Hammer, Westinghouse Power Line switchboard sticker date of 03/20/96. The panel is a four (4) section board. One section includes twenty-five (25) circuit breakers which feed branch panels and other equipment. Another section includes the 1600A disconnect.



Main Disconnect

Existing Service Condition

The existing main distribution panel at this school is in satisfactory condition. As per the panel sticker, this panel is not older than twenty-five (25) years and still within its useful life. There is no noticeable damage to the switchboard and conduits appear to be in acceptable condition.

The meter and CT cabinet also appears to be from the 1996 time frame. The meter condition is acceptable and an upgrade for this device is not necessary for this equipment at this time.

Service Capacity

The existing 1200A gear provides an approximate 311KW or 960A of available capacity. The peak usage for 2013-2014 was 176KW in August, 2013. The recorded peak load represents an approximate 57% of the total capacity that the 1200A service provides

Recommendations

Current service utility pole and related transformer are in acceptable condition and peak usage does not warrant any upgrade requirements. Meter is also within its usable life.

Main distribution switchboard and related feeders are in acceptable condition. No upgrades are necessary at this time for interior electrical distribution main components.

P. BUS GARAGE

Description of Existing Service

The electrical service at the bus garage is a 208/120V, 3-Phase, 4-Wire, 200A electrical service. It originates from a utility pole with three (3) pole top 15kVA transformers. The service comes into the building overhead to a weatherhead where the 200A main distribution panel is located. The main distribution panel contains a 200A main circuit breaker and an additional thirty-six (36) breakers for equipment, lighting, and power.



Main Distribution Panel

Main Electrical Service Condition

The utility transformers located on the pole do not appear to be from the original building construction. They appear to be functional and in good condition, and within their usable life.

The existing main distribution panel at this school does not appear to be from the original building construction; but has suffered some exterior and interior damage. The existing panel has a main circuit breaker, and as suggested, does not appear to date back to the original construction.

The existing main feeders to the panel also do not appear to be from the original building construction. The feeders come through the wall from the weatherhead above.

Service Capacity

The existing 45KVA service provides 41KW or 125A of available capacity. The peak usage for 2013-2014 was 27kW in December. The recorded peak load represents an approximate 66% of the total capacity of the main building transformer.

Recommendations

Current service utility pole and related fuses are in acceptable condition and peak usage does not warrant any upgrade requirements. Meter is also within its usable life.

Despite some wear and tear, the main service disconnect, related panels and conduit are all in acceptable condition and within their useful life. No upgrades are necessary at this time for interior electrical distribution main components.

SUMMARY

This section includes scope of work and budget cost estimates for boiler replacements at following buildings:

- A. North High School.
- B. South High School.
- C. Felix Festa Middle School - E Wing
- D. Birchwood Elementary School

A. NORTH HIGH SCHOOL

Existing Conditions

The North High School complex is served by three heating plants. The original 1953 heating plant serves the original building, the 1953 main building and 1961 addition. The Annex was originally served by the 1953 heating plant until a separate dedicated heating plant was recently constructed. The Link building is served by a dedicated heating plant.

The original 1953 heating plant includes three combination gas/light oil fired cast-iron steam boilers.

Boiler #1: Smith Model 28A-12 (2,353 MBH output) installed in 1995.

Boiler #2: Smith Mills 450-18 (2,872 MBH output) installed in 1953.

Boiler #3: Smith Model 28A-12 (2,353 MBH output) installed in 1995.

Median service life of a cast iron steam boiler is 30 years (2007 ASHRAE Applications Handbook).



Boiler #1 (ca. 1995)

Heating Loads

Estimated heating load for the building area served by the 1953 heating plant is 6,750 MBH. This assumes ventilation rates required by current codes. Assuming actual ventilation rates are lower, the actual heating load will be less. However, the proposed upgrades should be based on current ventilation requirements to support future building wide upgrades. Considering the age of the existing infrastructure, the District should plan to upgrade HVAC systems in the near future.

Recommendations

Replace Boiler #2 with a steam boiler that can be converted to heating hot water when the overall HVAC system is upgraded.

Minimum capacity for replacement boiler = 4,800 MBH to provide standby capacity in the event of a failure of Boilers #1 and #3.

Fuel oil piping has been modified over several projects and no longer functions properly. Fuel oil piping should be replaced with a new system including a duplex pump set to ensure adequate flow to each burner.

Vacuum return and condensate pump systems are in poor condition and should be replaced. Recommended scope includes a vacuum condensate pump and boiler feedwater system including dedicated feedwater pumps for each boiler and one standby pump.

The hot water converter and main heating pumps serving the 1962 classroom addition are in poor condition and should be replaced to ensure uninterrupted heating system operation in this area.

Recommended Scope:

- Remove existing boiler #2, vacuum pump, condensate pump and boiler feedwater pumps.
- Install new boiler in same location.
- Breeching and connection to existing chimney.
- Connect to existing BAS (TBS).
- Steam piping connections.
- Vacuum condensate pump set.
- Boiler feedwater tank, pumps and controls.
- Boiler feedwater piping.
- Pipe insulation.
- Duplex oil pump set.
- Replace oil piping.
- Gas piping connection.
- Replace 1962 addition heat exchanger, pumps and associated boiler room piping and controls.
- Electric power and safety controls.
- Painting and epoxy floor finish.
- Upgrade lighting.
- Provide 2nd means of egress from boiler room.



Boiler #2 (ca. 1953)

B. SOUTH HIGH SCHOOL**Existing Conditions**

South High School is served by a single heating plant.

The original 1970 heating plant includes two combination gas/light oil fired fire tube hot water boilers.

Boiler #1: Cleaver Brooks CB786-400 (16,738 MBH input) installed in 1970.

Boiler #2: Cleaver Brooks CB786-400 (16,738 MBH input) installed in 1970.

Domestic hot water is produced by an indirect fired storage tank with an instantaneous heat exchanger to boost supply water temperature to the kitchen.

Median service life of a steel fire tube boiler is 25 years (2007 ASHRAE Applications Handbook).

Recommendations

Estimated South HS heating load is 15,000 MBH.

Replace original 45 year old fire tube boilers with three (3) field erected water tube hot water boilers, each sized for 50% of the design heating load to provide standby capacity in the event of a boiler failure during the heating season.

Minimum capacity for each boiler = $15,000 \times 0.5 = 7,500$ MBH.

The water heater is original and should be replaced to improve efficiency and ensure uninterrupted service.

Recommended Scope:

- Remove existing boilers.
- Install three field erected water tube boilers.
- Breeching and connection to existing chimney.
- Connect to existing BAS (TBS).



Front View of Original Boilers



Water Leaking from Rear Door Gasket



Original Storage Water Heater

- Replace heating hot water piping, valves and accessories in boiler room.
- Replace secondary distribution pumps and provide VFD controls.
- Provide primary heating hot water pump at each boiler.
- Pipe insulation.
- Oil piping connections.
- Gas piping connections for water heaters and boilers.
- Electric power and safety controls.
- Replace original domestic water heater and associated piping and controls with high efficiency gas fired water heaters, storage tanks and central mixing valve station.
- Upgrade water treatment equipment.
- Provide combustion air supply system and controls.
- Painting and epoxy floor finish.
- Upgrade lighting.



Existing Zone Distribution Pumps



Elevated Compression Tank



Boiler Room Egress and Switchgear

C. FELIX FESTA MIDDLE SCHOOL - E WING**Existing Conditions**

E-Wing boiler room serves 1967 building addition and 2003 building additions including 2 story classroom addition adjacent to E-Wing and a small library addition.

The original 1967 heating plant includes two combination gas/light oil fired firetube hot water boilers.

Boiler #1: Cleaver Brooks CB907X-80 (3,347 MBH input) installed in 1967.

Boiler #2: Cleaver Brooks CB907X-80 (3,347 MBH input) installed in 1967.

Domestic hot water is produced by gas-fired storage type water heater. The water heater appears to be in good condition and should remain.

Median service life of a steel fire tube boiler is 25 years (2007 ASHRAE Applications Handbook).

Recommendations

Estimated E-Wing heating plant load is 4,600 MBH.

Replace original 48 year old fire tube boilers with two (2) cast iron hot water boilers, each sized for 100% of the design heating load to provide sufficient capacity in the event of a boiler failure during the heating season.

Minimum capacity for each boiler = 4,600 MBH MBH.

Recommended Scope:

- Remove existing boilers.
- Install two cast iron hot water boilers.
- Breeching and connection to existing chimney.
- Connect to existing BAS (TBS).
- Replace heating hot water piping, valves and accessories in boiler room.



- Replace secondary distribution pumps and provide VFD controls.
- Provide primary heating hot water pump at each boiler.
- Pipe insulation.
- Oil piping connections.
- Gas piping connections.
- Electric power and safety controls.
- Upgrade water treatment equipment.
- Replace combustion air supply system and controls.
- Painting and epoxy floor finish.
- Upgrade lighting.



D. BIRCHWOOD ELEMENTARY SCHOOL**Existing Conditions**

The original 1964 heating plant includes two combination gas/light oil fired firetube hot water boilers.

Boiler #1: Cleaver Brooks CB907X-80 (3,347 MBH input) installed in 1964.

Boiler #2: Cleaver Brooks CB907X-80 (3,347 MBH input) installed in 1964.



Domestic hot water is produced by gas-fired storage type water heater. The water heater appears to be in good condition and should remain.

Median service life of a steel fire tube boiler is 25 years (2007 ASHRAE Applications Handbook).

Recommendations

Estimated building heating load is 2,000 MBH.

Replace original 51 year old fire tube boilers with two (2) cast iron hot water boilers, each sized for 100% of the design heating load to provide sufficient capacity in the event of a boiler failure during the heating season.



Minimum capacity for each boiler = $2,000 \times 1.0 = 2,000$ MBH.

Recommended Scope:

- Remove existing boilers.
- Install two cast iron hot water boilers.
- Breeching and connection to existing chimney.
- Connect to existing BAS (TBS).
- Replace heating hot water piping, valves and accessories in boiler room.
- Replace secondary distribution pumps and provide VFD controls.
- Provide primary heating hot water pump at each boiler.
- Pipe insulation.
- Oil piping connections.
- Gas piping connections.
- Electric power and safety controls.
- Upgrade water treatment equipment.
- Painting and epoxy floor finish.
- Upgrade lighting.

BUDERUS

G315 | G515 | G615

Cast Iron Commercial Boilers



- High Efficiency—Combustion Efficiencies Up to 88.2%
- 350 to 3,982 MBH Output
- Thermostream Design Eliminates Thermal Shock

Superior Equipment by Design

Comfortable. Efficient. Intelligent Heating.

Buderus



G315 | G515 | G615

A Better Way to Heat

The Buderus commercial Thermostream boilers are designed with many physical attributes setting them above the competition and increasing their longevity and efficiency. The burner doors are field adjustable to swing fully open from either side, to enable the boilers to fit in any location. These boilers are shipped knocked down for easy transport, the G315 and the G515 can also be shipped as an assembled block. Due to the unique chamber design, no refractory materials are used. This reduces the number of service calls and maximizes heat transfer. Buderus precision castings eliminate the need for manual grinding. Precision beveled steel push nipples join cast iron sections and high temperature flue sealants are used to sustain pressurized operation.

The G315 and G515 come with a full 3½" of thermal insulation, and the G615 comes with a full 4" of thermal insulation to reduce standby heat loss. All Buderus cast iron commercial boilers are manufactured with the Buderus GL-180M cast iron with a silicone "barrier skin." To streamline the appearance of the boilers, the supply and return connections for the G315 are located at the rear of the boiler, while the G515/G615 have top supply and a rear return. These boilers are for use with hot water and can be installed with gas, oil or dual fuel burners.

Intelligent Heating—by Design

Buderus, the world leader in heating technology, manufactures the highest quality boilers based on centuries of experience. With its innovative design and quality manufacturing, a Buderus boiler will outlast and out-perform virtually any other commercial hot water boiler system in the world.

The G315, G515 and G615 are designed to maximize the heating value of every ounce of fuel and are built with the highest quality materials. Established in 1731, Buderus uses state-of-the-art techniques in the design and manufacturing of its boilers.

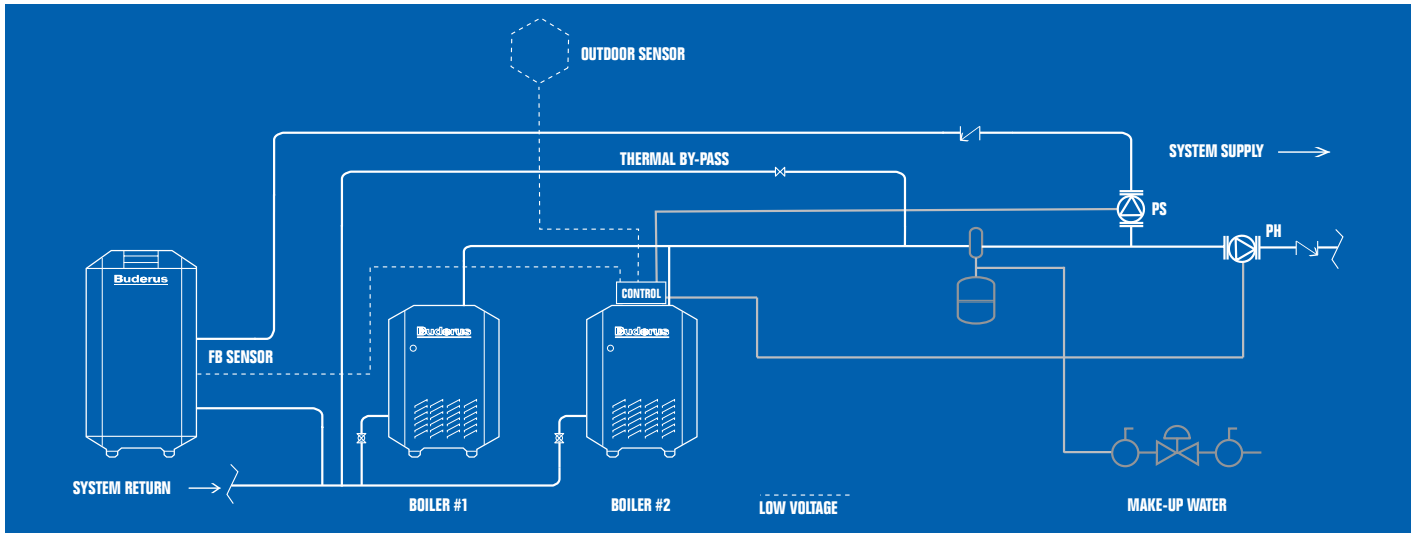
Thermostream Design

The Buderus developed Thermostream principle is proven for higher efficiency and improved system reliability in high volume heating systems. Condensation and thermal shock are made impossible by design, as cool return water mixes internally and is preheated with supply water before exposure to directly heated surfaces. This process eliminates hot and cold spots in the boiler and balances water flow throughout all boiler sections. The Thermostream design permits continuous low temperature operation under normal return water without requiring a minimum boiler return temperature. Internal water circulation and injection into each boiler section combined with deflection plates ensure condensate free boiler operation—even under no flow conditions.



Design Benefits

- Eliminates the need for bypass loop or shunt pump
- Eliminates hot and cold spots in the boiler
- Allows operation at low return water temperatures without thermal shock concerns
- Minimum supply temperature of 122°F with standard control
- Ensures balanced water flow through all boiler sections



NOTE: This drawing is conceptual in nature and does not purport to address all design, installation or safety considerations.

Boiler Construction

The boiler sections are assembled with beveled, surface-profiled push nipples for long, trouble-free watertight operation. Boiler flueways are manufactured to be gas tight with tongue and groove section design and elastic, high temperature resistant sealing rope. A permanent dry door gasket ensures repeated positive sealing of the full swing burner door. Because flue gases cannot escape through the seams between boiler sections, the boilers are able to retain heat more efficiently.

GL-180M Gray Cast Iron

Buderus GL-180M silicone injected, gray cast iron obtains its superior material characteristics primarily from a high carbon (graphite) and silicone content.

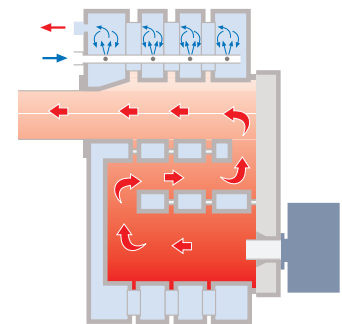
Buderus GL-180M gray cast iron has excellent corrosion resistance, exceptional casting characteristics, 40% greater flexibility and elasticity as well as high thermal conductivity. Buderus developed the special substances that are impregnated during the casting process to improve the mechanical properties of cast iron. The graphite precipitates into smaller, modified flakes which produce GL-180M cast iron with 40% greater elasticity and a high silicone barrier for corrosion protection. All sections are heat treated to relieve thermal stresses. Additional elements further enhance the properties of the GL-180M. The graphite appears in two different forms in the microstructure: nodular form producing excellent tensile strength and great elasticity and graphite flakes producing excellent corrosion resistance against acidic combustion products.

Full Three Pass Design—for High Efficiency

Buderus developed the full three pass system to increase the heat transfer and efficiency of boilers. This design allows more heat to be transferred during all three passes, unlike conventional boilers that only use one pass to transfer heat. This system maximizes the total possible heat available with the lowest fuel consumption possible. To greatly decrease standby loss Buderus has manufactured a 3½" and 4" thick thermal insulation.

The Three-Pass Boiler is Designed for:

- Optimized combustion with positive pressure-fired boilers and tailored chamber geometry—no need for a heat-consuming refractory or target wall eliminating the need for costly repairs
- Minimal stack losses with the modified three-pass flue design's large heat transfer areas
- Low standby losses with a full 3½" to 4" jacket of thermal insulation around the entire block—even underneath the boiler



How it Works

The flame fires into the first chamber. Then the flue products flow through the second pass to the front of the boiler. From there they reverse direction again—moving through the third pass to the back, and finally exiting via the flue connection into the chimney. Because the gases are held in the boiler longer this allows the cast iron to absorb the maximum amount of heat, resulting in a lower stack temperature and a higher efficiency.

Complete Your System



Complete Your System

Once you have a Buderus boiler, you can add a Buderus indirect fired hot water tank, an optional Buderus Logamatic Control or both. The Logamatic Control maximizes your comfort and fuel savings. It will also accommodate specialized heating applications such as radiant flooring. Combined, this premium heating system will provide years of exceptional comfort and economy.

Convenient Logamatic Control

Logamatic Controls can be used to adjust the firing rates of burners in multi-boiler systems. Controls can be pre-programmed with automatic night and day functions and set to trigger automatic adjustments based on shifts in outdoor or indoor temperatures. An optional module is available for direct communication with building management systems.

4000 Logamatic Control Series

The intelligent regulation of energy is the heart of any heating system. A Logamatic Control provides the ability to make finer adjustments than are possible by manually turning the boiler off and on or relying on traditional thermostats. Multiple design innovations increase the versatility of Buderus Logamatic Controls including the automatic adjustment between various modes of operation. A change in modes can be set to correspond with time, date or temperature. Modes can also be changed manually. All Logamatic Controls now include summer, winter and vacation modes which effectively regulates energy consumption. This regulation is effective in single or multi-boiler systems, with any heat source and with one or multiple heating zones.

Heatronic 4000 Control Series

The Heatronic 4000 is pre-loaded with the parameters for Bosch and Buderus commercial boilers. Pre-programmed options include fuel type, boiler type, high and low fire outputs, motor speed, pump purge time, maximum temperature output, and min/max modulation parameters. The Heatronic 4000 works with up to four condensing and non-condensing boilers that are either modulating, single stage or two stage. Designed to accurately maintain target water temperature based on outdoor temperature reset or a fixed setpoint for space or process heating applications. Optional features to increase efficiency and boiler plant reliability include domestic hot water and setpoint heating, boiler run-time balancing, stand-by primary pump operation, and pump exercising.

4000 Logamatic Control Series

Integrated multi-boiler system controller with the following features and optional control modules:

- Outdoor reset, staged burner operation
- Control of single, two-stage and modulating burners (Up to 8 boilers)
- Automatic and load/switch dependent boiler rotation
- Operation of boiler pumps, 2-way valves, 3 or 4-way valves and system pumps
- BMS interface capability
- External load capability: DHW and other on-demand loads
- Self diagnostics and system parameter display

G315 Series

Model	G315/5	G315/6	G315/7	G315/8	G315/9
Performance Data					
Gross Output MBH	350	454	559	663	768
Number of Sections	5	6	7	8	9
Max. Input Gas MBH	433	556	678	801	924
Max. Input Oil	3.0	3.85	4.7	5.6	6.4
Net IBR MBH	304	395	486	577	668
Boiler HP	10.4	13.6	16.6	19.8	22.9
Max. Operating Pressure (psi)	87	87	87	87	87
Combustion Efficiency Oil	86.8%	86.9%	87%	87.1%	87.1%
Combustion Efficiency Gas	84.2%	84.3%	84.4%	84.4%	84.4%
Thermal Efficiency Oil	83.3%	84.3%	84.9%	85.4%	85.7%
Thermal Efficiency Gas	80.0%	81.8%	82.4%	82.8%	83.1%
Piping Connections					
Vent Connection Size, in.	7	7	7	7	7
Supply, in.	3	3	3	3	3
Return, in.	3	3	3	3	3
Physical Dimensions					
Overall Boiler Length, in. (LG)	44¼	50½	56¾	63¼	69½
Boiler Block Length, in. (LK)	38¼	44½	50¾	57	63½
Boiler Door Thickness, in.	5	5	5	5	5
Minimum Boiler Width, in. (BE)	28	28	28	28	28
Height, in.	40¾	40¾	40¾	40¾	40¾
Fire Box Depth, in. (LF)	31	37½	43¾	50	56¼
Fire Box Diameter, in.	15¾	15¾	15¾	15¾	15¾
Fire Box Volume (cu. ft.)	5.19	6.39	7.59	8.79	9.99
Dry Weight (lbs.)	1,197	1,391	1,585	1,779	1,973
Water Content (gal.)	37.8	45.2	52.6	60.0	67.4
Operating Weight (lbs.)	1,512	1,768	2,024	2,280	2,545

Boiler Model	315/5	315/6	315/7	315/8	315/9
Foundation Length L1, in.	36	42¼	48½	54¼	61
Flat Plate Length L2, in.	28¾	35	41¼	47¼	54

The boiler must be placed on a smooth, level concrete base, 33½" wide. Cement in the base or place on its top either 4"x ¼" flat steel plates or 4" x 2" x ¼" angle irons for boiler support. Dimensions L1 and L2 are specified in the table above.

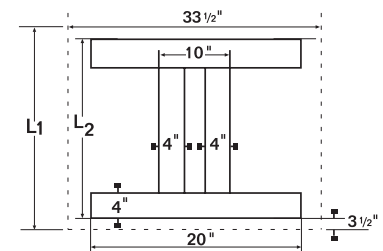
Buderus recommends the use of Beckett, Gordon Platt, Power Flame and Riello burners for oil/gas firing (Buderus stocks Riello and Beckett burners).



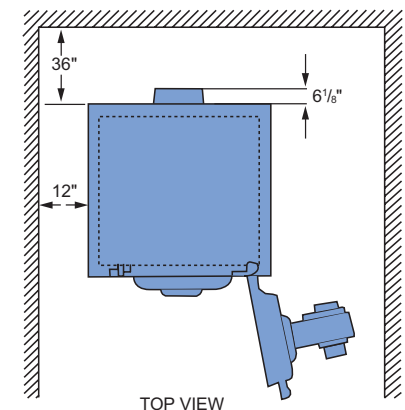
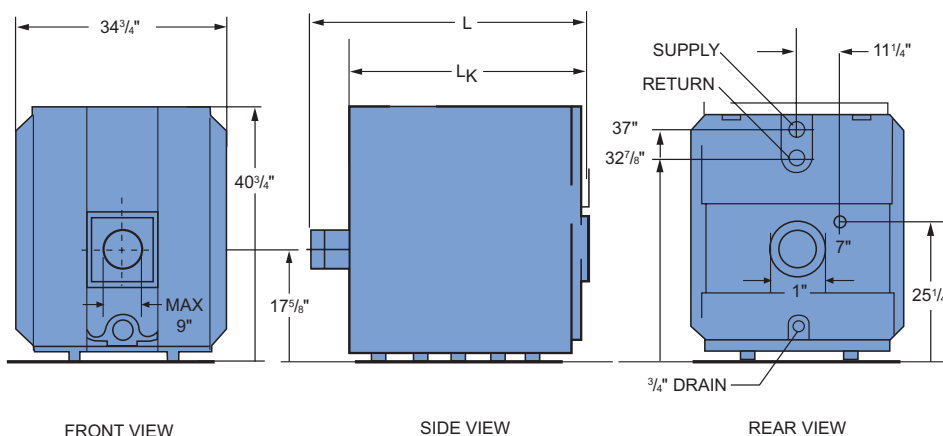
MEA Approved
 CRN Approved
 MA Approved

Approval numbers are subject to periodic changes and updates. Please visit www.buderus.us for the most up-to-date approval numbers.

G315 Foundation Dimensions

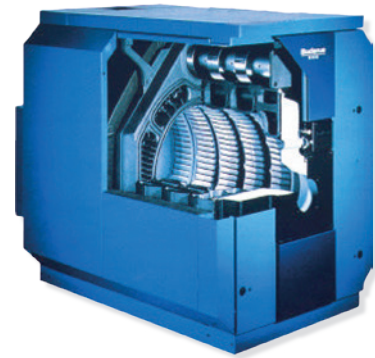


315 Section Weights in lbs		
Front	Intermediate	Rear
199	199	199



G515 Series

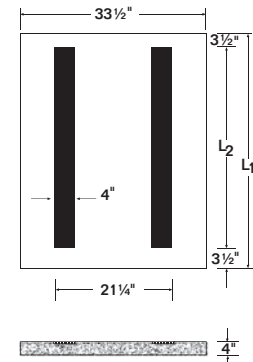
Model	G515/7	G515/8	G515/9	G515/10	G515/11	G515/12
Performance Data						
Gross Output MBH	818	1,009	1,201	1,392	1,583	1,775
# of Sections	7	8	9	10	11	12
Max Input Gas MBH	995	1,216	1,438	1,660	1,881	2,103
Max Input Oil GPH	6.9	8.4	10.0	11.6	13.0	14.6
Net IBR MBH	711	877	1,044	1,210	1,377	1,543
Boiler HP	24.5	30.2	35.9	41.6	47.3	53
Max Operating Pressure (psi)	87	87	87	87	87	87
Combustion Efficiency Oil	88.2%	88.2%	88.1%	88.1%	88.1%	88.1%
Combustion Efficiency Gas	85.6%	85.5%	85.5%	85.5%	85.4%	85.4%
Thermal Efficiency Oil	84.8%	85.5%	86.1%	86.4%	86.8%	87.0%
Thermal Efficiency Gas	82.2%	83.0%	83.5%	83.9%	84.2%	84.4%
Piping Connections						
Vent Connection Size, in.	10	10	10	10	10	10
Supply, in.	4	4	4	4	4	4
Return, in.	4	4	4	4	4	4
Physical Dimensions						
Overall Boiler Length, in. (LG)	62¼	69	75¼	82½	89¼	95¼
Boiler Block Length, in. (LK)	54½	61	67½	74¼	81	87½
Boiler Door Thickness, in.	5	5	5	5	5	5
Minimum Boiler Width, in. (BE)	33	33	33	33	33	33
Height, in.	52¼	52¼	52¼	52¼	52¼	52¼
Fire Box Depth, in. (LF)	45¼	52½	59¼	66	72½	79¼
Fire Box Diameter, in.	20¼	20¼	20¼	20¼	20¼	20¼
Fire Box Volume (cu. ft.)	14.87	17.16	19.46	21.75	24.05	26.31
Dry Weight (lbs.)	2,731	3,059	3,505	3,864	4,188	4,541
Water Content (gal.)	68.2	77.7	87.2	96.7	106.2	115.7
Operating Weight (lbs.)	3,300	3,707	4,233	4,671	5,074	5,506



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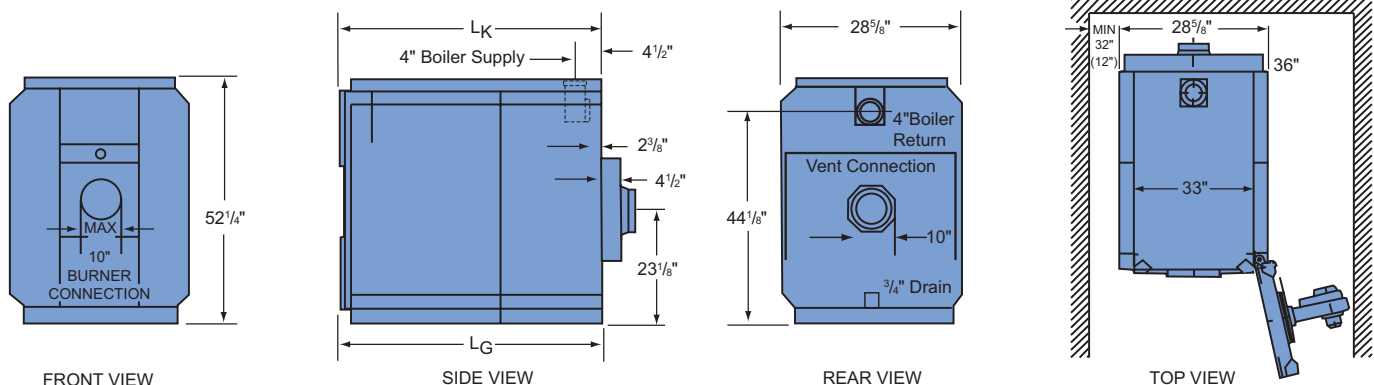
G515 Foundation Dimensions



Boiler Model	515/7	515/8	515/9	515/10	515/11	515/12
Foundation Length L1, in.	53½	60¼	67	73½	80¼	87
Flat Plate Length L2, in.	46¾	53½	60¼	67	73½	80¼

515 Section Weights in lbs		
Front	Intermediate	Rear
326	331	357

The boiler must be placed on a smooth, level concrete base, 33½" wide. Cement in the base or place on its top either 4"x ¼" flat steel plates or 4" x 2" x ¼" angle irons for boiler support. Dimensions L1 and L2 are specified in the table above. Buderus recommends the use of Beckett, Gordon Platt, Power Flame and Riello burners for oil/gas firing (Buderus stocks Riello and Beckett burners).



G615 Series

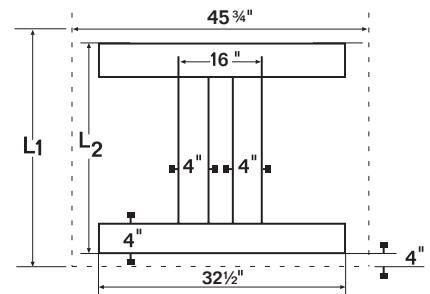
Model	G615/9	G615/10	G615/11	G615/12	G615/13	G615/14	G615/15	G615/16
Performance Data								
Gross Output MBH	1,201	2,242	2,532	2,822	3,112	3,402	3,692	3,982
Number of Sections	9	10	11	12	13	14	15	16
Max. Input Gas MBH	1,438	2,670	3,031	3,392	3,753	4,113	4,474	4,835
Max. Input Oil	16.0	18.5	21.0	23.5	26.0	28.5	31.0	33.5
Net IBR MBH	1,697	1,950	2,202	2,454	2,706	2,958	3,210	3,463
Boiler HP	58.3	66.9	75.6	84.3	92.9	101.6	110.3	118.9
Max. Operating Pressure (psi)	87	87	87	87	87	87	87	87
Combustion Efficiency Oil	88.1%	86.7%	86.6%	86.6%	86.5%	86.5%	86.5%	86.5%
Combustion Efficiency Gas	85.5%	84.1%	84%	84%	83.9%	83.9%	83.9%	83.9%
Thermal Efficiency Oil	86.1%	86.5%	86.1%	85.8%	85.5%	85.3%	85.1%	84.9%
Thermal Efficiency Gas	83.5%	83.9%	83.5%	83.2%	82.9%	82.7%	82.5%	82.4%
Piping Connections								
Vent Connection Size, in.	14	14	14	14	14	14	14	14
Supply, in.	6	6	6	6	6	6	6	6
Return, in.	6	6	6	6	6	6	6	6
Physical Dimensions								
Overall Boiler Length, in. (LG)	75¾	82½	89¼	96	102½	109¼	116	122¾
Boiler Block Length, in. (LK)	71	77¾	84½	92	97¾	104½	111¼	117¾
Boiler Door Thickness, in.	5	5	5	5	5	5	5	5
Minimum Boiler Width, in. (BE)	50½	50½	50½	50½	50½	50½	50½	50½
Height, in.	62¾	62¾	62¾	62¾	62¾	62¾	62¾	62¾
Fire Box Depth, in. (LF)	60	66¾	73½	80	86¾	93½	100¼	106¾
Fire Box Diameter, in.	26¾	26¾	26¾	26¾	26¾	26¾	26¾	26¾
Fire Box Volume (cu. ft.)	23.56	26.21	29.07	31.46	34.08	36.72	39.34	41.97
Dry Weight (lbs.)	5,510	6,045	6,580	7,110	7,645	8,160	8,799	9,125
Water Content (gal.)	144	160	176	192	208	224	240	256
Operating Weight (lbs.)	6,740	7,390	8,050	8,720	9,390	10,040	10,720	11,280



MEA Approved
CRN Approved
MA Approved

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G615 Foundation Dimensions

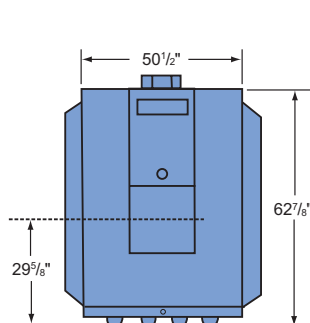


Boiler Model	615/9	615/10	615/11	615/12	615/13	615/14	615/15	615/16
Foundation Length L1, in.	65¾	72½	79¼	86	92¾	99¼	106	112½
Flat Plate Length L2, in.	58	64½	71¼	78	84½	91¼	98	104¾

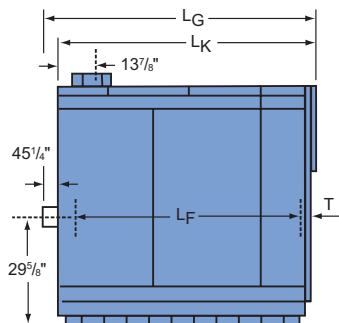
615 Section Weights in lbs		
Front	Intermediate	Rear
565	545	657

The boiler must be placed on a smooth, level concrete base, 33½" wide. Cement in the base or place on its top either 4" x ¼" flat steel plates or 4" x 2" x ¼" angle irons for boiler support. Dimensions L1 and L2 are specified in the table above.

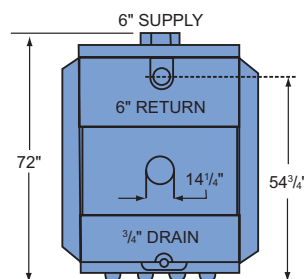
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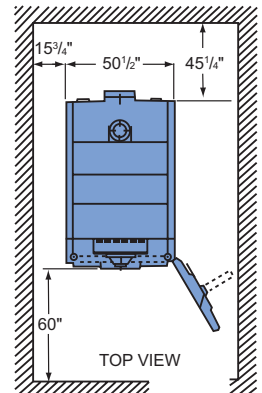
FRONT VIEW



SIDE VIEW



REAR VIEW



TOP VIEW

G315 | G515 | G615

Cast Iron Commercial Boilers



The full swing burner door on the combustion chamber allows for easy, thorough and proper cleaning in a fraction of the time it takes to clean a conventional boiler.

Superior Design

- Designed to operate at any return water temperature
- Full swing burner door for easy and quick, thorough cleaning
- No refractory parts for reduced maintenance
- Boiler fully serviced and cleaned from the front
- Cast iron breaching for long life
- Thermostream design increases efficiency and system reliability
- High efficiency through full three-pass boiler design
- No thermal shock as result of unique Thermostream boiler design
- No minimum water temperature
- Savings in overall equipment costs, installations and annual operating costs
- High combustion and thermal efficiencies

Commercial Boiler Specifications

- 1 There shall be provided and installed a quantity of ___ G315, G515 or G615 Buderus sectional cast iron hot water boiler(s) with a total gross output rating of ___ MBH, suitable for forced draft firing with No. 2 fuel oil, natural gas, or propane. Maximum operating pressure of the boiler(s) shall be 87 psi. They shall bear the ASME stamp and IBR rating.
- 2 Boiler(s) shall be fabricated with GL-180M high silicone cast iron. They shall be of wet base, double wall, sectional construction with precision machined steel push nipples. Boiler(s) shall have a 5 year warranty against defects in the heat exchanger.
- 3 Boiler(s) shall be of full three pass design, capable of achieving combustion efficiencies up to 87.1% on oil and up to 84.5% on gas at full firing rate. Boiler(s) shall contain no refractory material or combustion target wall.
- 4 Boiler(s) shall be capable of sustained operation at any return water temperature without any means external to the boiler to temper or preheat return water. When operating with standard high temperature controls a water temperature of 122°F must be reached within ten minutes at the boiler supply during burner operation.
- 5 Access to boiler firesides for inspection and service shall be through a fully insulation and jacketed door, field adjustable for left or right hinging. The seal between door and boiler casing shall be a permanent dry gasket for repeated positive sealing. All flue passages shall be accessible only through the front door and removable rear clean-out covers.
- 6 Boiler(s) shall be furnished with a heavy-gauge baked enamel jacket with a full 3½" or 4" insulation on top and on all sides, flanged water connections and a cast iron flue collector for long life.

Operational Requirements for the G315, G515 and the G615

- Maintain minimum 122°F supply temperature with standard high temperature controls during burner operation within 10 minutes after burner starts up.
- No additional requirements for firing with 2-stage or full modulation burners (gas or oil).
- No minimum return water temperature and no minimum flow requirement.
- Boiler(s) shall not require return water temperature control or minimum flow condition.

Approval numbers are subject to periodic changes and updates. Please visit our web site for the most up-to-date approval numbers.



A Tradition of Excellence

The world leader in heating technologies since 1825, Buderus produced the first low-temperature hydronic heating systems. Today, Buderus products are acknowledged as the global standard in high-efficiency, low emissions hydronic heating. All Buderus products are designed to meet strict safety and environmental regulations.

Buderus boilers are quick and easy to install and will outlast and outperform virtually any other hot water heating system. They are designed for easy access and service. With appropriate maintenance, Buderus boilers deliver the highest efficiencies throughout the lifespan of operation. Buderus is a member of Bosch Thermotechnology.

75H95027 04/15
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Specification Data

UNILUX

MULTIPASS FLEXIBLE WATERTUBE BOILERS
HOT WATER BOILERS



**Unilux Advanced
Manufacturing, LLC**
30 Commerce Park Drive
Niskayuna, NY 12309
518.344.7490

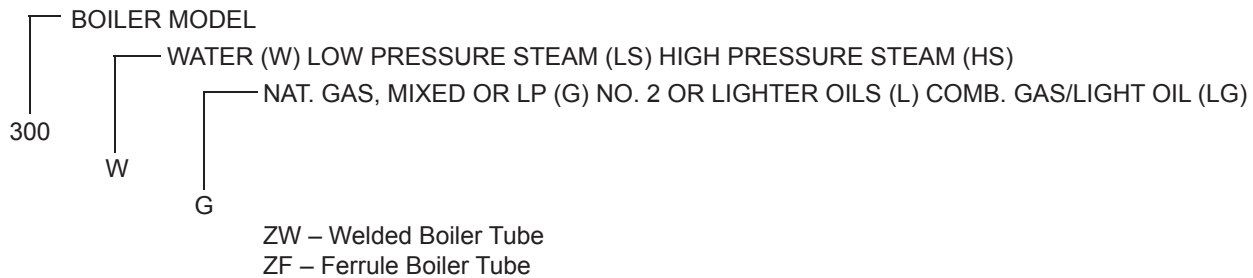
Fax: (518) 344-7495
E-mail: info@uniluxam.com
Web Site: www.uniluxam.com

"From commercial comfort to industrial process"

UNILUX HOT WATER BOILER CAPACITIES:

BOILER MODEL W	MAXIMUM FUEL INPUT BTU/HR IN THOUSANDS	BOILER OUTPUT BTU/HR IN THOUSANDS	APPROX. BOILER HORSE POWER	SHIPPING WEIGHT LBS	OPERATING WEIGHT LBS	WATER CONTENT U.S. GALLONS
100	1250	1062	31.5	3290	3790	60
150	1750	1488	44.5	3800	4380	70
200	2200	1870	56	4400	5035	76
250	2750	2338	70	5000	5750	90
300	3000	2550	76	5600	6410	97
350	3750	3188	95.2	6100	6985	106
400	4300	3655	109	6800	7800	120
500	5400	4590	137	8200	9660	175
600	6250	5313	159	9000	10625	195
700	7235	6150	184	10000	11820	218
800	8270	7030	210	11400	13650	270
900	9300	7905	236	12140	14580	293
1000	10330	8780	262	13200	15870	320
1200	12400	10540	315	15480	18625	377
1400	14470	12300	367	16600	20100	420
1600	16530	14050	420	18800	22680	465
1800	18600	15810	472	20960	25210	510
2000	20670	17570	525	22700	27290	550
2500	25000	21250	635	28500	35000	776
2900	29000	24650	736	30800	38000	865
3000	34000	28900	863	43160	53880	1285
3500	38000	32300	965	49000	61340	1480

ORDER NUMBER PROCEDURE: Example – ZF 300WG



SPECIFICATIONS ARE SUBJECT
TO CHANGE WITHOUT NOTICE.
DIMENSIONS MUST BE CONFIRMED
FOR CONSTRUCTION.

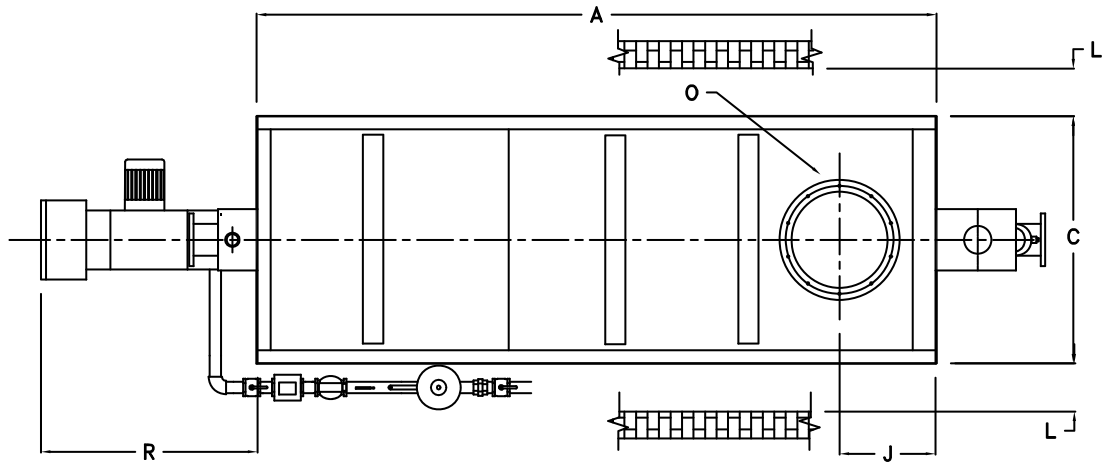
STANDARD EQUIPMENT:

- PRESSURE GAUGE • THERMOMETER
- LWCO • RELIEF VALVES • BURNER OPERATING AND SAFETY TEMPERATURE CONTROLS

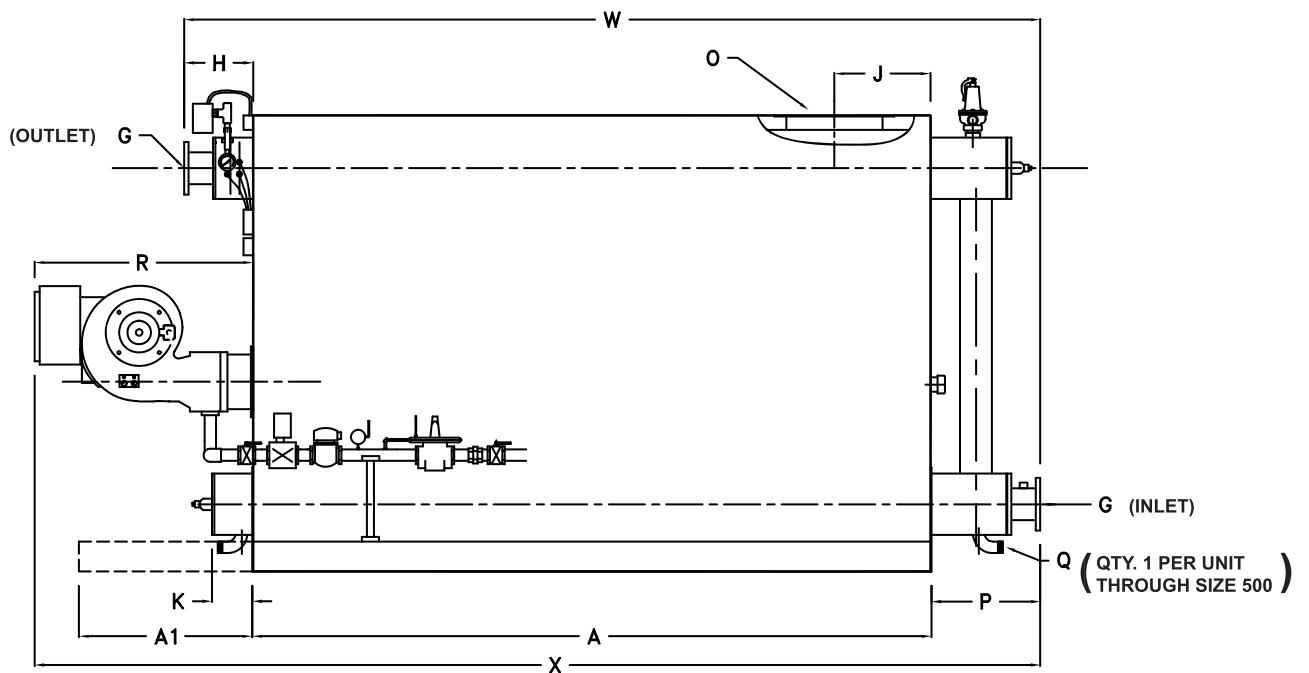
UNILUX REPRESENTATIVE:

ALL BURNER EQUIPMENT UL, CSA APPROVED

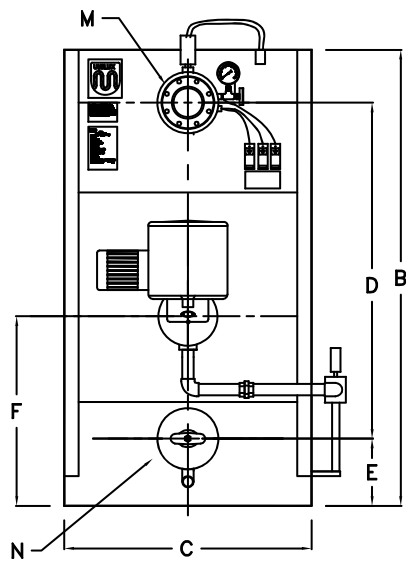




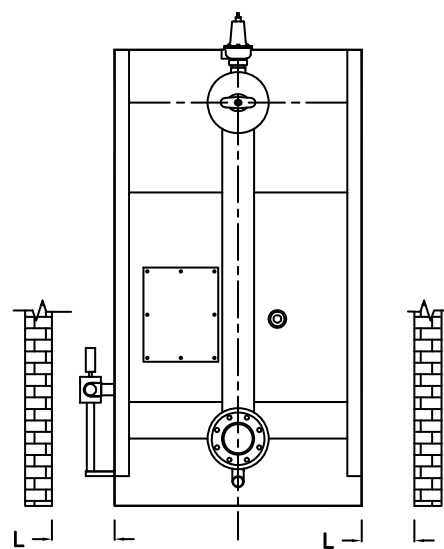
TOP VIEW



SIDE VIEW



FRONT VIEW



REAR VIEW

HOT WATER BOILER

DIMENSIONS

	BOILER MODEL-W	100	150	200	250	300	350	400	500	600	700	800
A	LENGTH OF BASE	51	63	63	72	72	78	87	99 1/4	111 1/4	120 1/2	120 1/2
A1	LENGTH OF SUPPORT FROM BASE	-	-	-	-	-	-	-	-	-	-	-
B	HEIGHT	71 1/2	71 1/2	76	76	80 1/2	80 1/2	80 1/2	85	85	87	95
C	WIDTH OF BASE	35 1/2	35 1/2	39 1/2	39 1/2	43 1/2	43 1/2	43 1/2	45 1/2	45 1/2	47 1/2	51 1/2
D	CTR. LOWER DRUM TO CTR. UPPER DRUM	52 1/2	52 1/2	57	57	61 1/2	61 1/2	61 1/2	64	64	66	70
E	CENTER OF LOWER DRUM TO BOTTOM	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2	11	11	11	14
F	CENTER OF BURNER OPENING TO BOTTOM	27	27	29	29	31	31	31	34	34	35	39 1/2
G	INLET/OUTLET FLANGE, CLASS 150	2 1/2	2 1/2	3	3	4	4	4	5	5	5	6
H	NOZZLE CLEARANCE FROM TOP FRONT	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4	14 1/4
J	CENTER OF FLUE GAS OUTLET TO REAR	14	14	15	15	16	16	17	17	18	19	19
K	DRUM CLEARANCE FROM BASE, FRONT	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	8 5/8	8 5/8	8 5/8	8 5/8
L	TUBE REMOVAL CLEARANCE FROM BASE	18	18	22	22	26	26	26	28	28	30	34
M	UPPER DRUM O.D., NPS	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	10 3/4	10 3/4	10 3/4	12 3/4
N	LOWER DRUM O.D., NPS	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	10 3/4	10 3/4	10 3/4	12 3/4
O	FLUE GAS OUTLET, I.D.	8	8	10	10	12	12	14	14	16	18	18
P	NOZZLE CLEARANCE FROM BASE, REAR	19 1/8	19 1/8	19 1/8	20 1/8	20 1/8	20 1/8	20 1/8	21 5/8	21 5/8	22 5/8	22 5/8
Q	BLOWDOWN, NPT	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2
R	BURNER DIMENSION (EST)	34	34	34	38	38	38	38	38	38	46	46
W	OVERALL BOILER LENGTH	84 3/8	96 3/8	96 3/8	106 3/8	106 3/8	112 3/8	121 3/8	135 1/8	147 1/8	157 3/8	157 3/8
X	OVERALL BOILER LENGTH WITH BURNER	104 1/8	116 1/8	116 1/8	130 1/8	130 1/8	136 1/8	145 1/8	158 7/8	170 7/8	189 1/8	189 1/8

	BOILER MODEL-W	900	1000	1200	1400	1600	1800	2000	2500	2900	3000	3500
A	LENGTH OF BASE	129 1/2	141 1/2	159 1/2	174 3/4	186 3/4	186 3/4	195 3/4	204 3/8	219 1/16	237 1/2	265 1/2
A1	LENGTH OF SUPPORT FROM BASE	-	-	-	-	-	-	-	-	-	TBA	TBA
B	HEIGHT	95	95	99	99	101	106 1/2	106 1/2	129 7/16	135 3/8	147 1/2	157 1/2
C	WIDTH OF BASE	51 1/2	51 1/2	55 1/2	55 1/2	59 1/2	65 1/2	71 1/2	84	84	102	102
D	CTR. LOWER DRUM TO CTR. UPPER DRUM	70	70	74	74	76	81 1/2	81 1/2	98	104	115	125
E	CENTER OF LOWER DRUM TO BOTTOM	14	14	14	14	14	14	14	15 7/16	15 7/16	17 1/2	17 1/2
F	CENTER OF BURNER OPENING TO BOTTOM	39 1/2	39 1/2	41	41	41	44 1/2	44 1/2	52	54 1/4	59	61
G	INLET/OUTLET FLANGE, CLASS 150	6	6	6	8	8	8	8	10	10	10	12
H	NOZZLE CLEARANCE FROM TOP FRONT	14 1/4	14 1/4	14 1/4	17 1/8	17 1/8	17 1/8	17 1/8	24 7/8	24 7/8	24 7/8	24 7/8
J	CENTER OF FLUE GAS OUTLET TO REAR	20	20	21	22	23	23	23	28	30	28	29
K	DRUM CLEARANCE FROM BASE, FRONT	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	8 5/8	10 3/8	10 3/8	10 3/8	10 3/8
L	TUBE REMOVAL CLEARANCE FROM BASE	34	34	38	38	42	48	54	60	60	76	76
M	UPPER DRUM O.D., NPS	12 3/4	12 3/4	12 3/4	12 3/4	12 3/4	12 3/4	12 3/4	16	16	16	16
N	LOWER DRUM O.D., NPS	12 3/4	12 3/4	12 3/4	12 3/4	12 3/4	12 3/4	12 3/4	16	16	16	16
O	FLUE GAS OUTLET, I.D.	20	20	22	24	24	26	26	28	30	30	32
P	NOZZLE CLEARANCE FROM BASE, REAR	22 5/8	22 5/8	22 5/8	25 1/8	25 1/8	27 1/8	27 1/8	37 7/8	37 7/8	37 3/4	37 3/4
Q	BLOWDOWN, NPT	2	2	2	2	2	2	2	2	2	2	2
R	BURNER DIMENSION (EST)	46	46	46	46	46	46	46	46	46	46	46
W	OVERALL BOILER LENGTH	166 3/8	178 3/8	196 3/8	217	229	231	240	267 1/8	281 13/16	300 1/8	328 1/8
X	OVERALL BOILER LENGTH WITH BURNER	198 1/8	210 1/8	228 1/8	245 7/8	257 7/8	259 7/8	268 7/8	288 1/4	302 15/16	321 1/4	349 1/4

Note: Burner dimension "R" is based upon approximate lengths of combustion equipment.
Actual dimensions for "R" and "X" may vary accordingly.

ALL DIMENSIONS SHOWN IN INCHES

Note: Dimensions subject to change without notice.
Consult factory for certified dimensions.



The Ultimate Heat

Conquest® CONDENSING WATER HEATER

AquaPLEX® Storage Tank and Heat Exchanger (unlined duplex alloy) • 130 Gallon Tank

MODEL ▼	INPUT BTU	Modulating	RECOVERY GPH (Thermal Efficiency)		GAS CONNECTION NPT	VENT DIAMETER (ETL listed for longer vents with larger dia.)	OPERATING Weight (lbs)
			70°F to 140°F ①	40°F to 140°F ②			
40 L 130A-GCL	399,000	No	657 (96%)	471 (97%)	3/4	4" @ 100 eq. ft.	1800
50 L 130A-GCML	500,000	Yes	823 (96%)	588 (97%)	1	4" @ 100 eq. ft.	
60 L 130A-GCML	600,000	Yes	988 (96%)	699 (97%)	1	6" @ 150 eq. ft.	
70 L 130A-GCML	700,000	Yes	1152 (96%)	815 (97%)	1	6" @ 150 eq. ft.	
80 L 130A-GCML	800,000	Yes	1317 (96%)	932 (97%)	1	6" @ 150 eq. ft.	

① Recoveries and thermal efficiency based upon DOE 10 CFR 431 testing per ANSI Z21.10.3 @ 70°F to 140°F.

② Recoveries and thermal efficiency based upon 40°F entering water temperature..

Dimensions are in inches unless otherwise indicated.

For standard and optional equipment, refer to form PV 8293.

Empty weight is 680 pounds and shipping weight is 880 pounds (all models)



Standard Electrical Service

120VAC, 1Ø, 60 Hz.
All models < 11 amps.

Venting

Use a Category IV PVC, CPVC or ETL, UL, ULC or CSA listed stainless steel or Centrotherm InnoFlue SW Polypropylene vent.
Minimum vent length is 5 eq. feet.
Maximum vent length varies by model number and vent diameter.
Do not size vent based only upon connection diameter at the appliance.
Refer to installation manual for sizing requirements.

Inlet Combustion Air Duct

Use PVC or galvanized pipe.
For model 40, up to 100 eq. ft. using 4" diameter pipe.
For model 50, up to 60 eq. ft. using 4" diameter pipe.
For models 60, 70 & 80, up to 150 eq. ft. using 6" pipe.
Longer lengths are ETL listed with larger diameters, refer to installation manual.

Gas Pressure - Natural

Minimum inlet flow pressure 3.5" W.C.
Maximum static pressure 10.5" W.C.
For LP gas, refer to installation manual.

Minimum Clearance from Combustibles

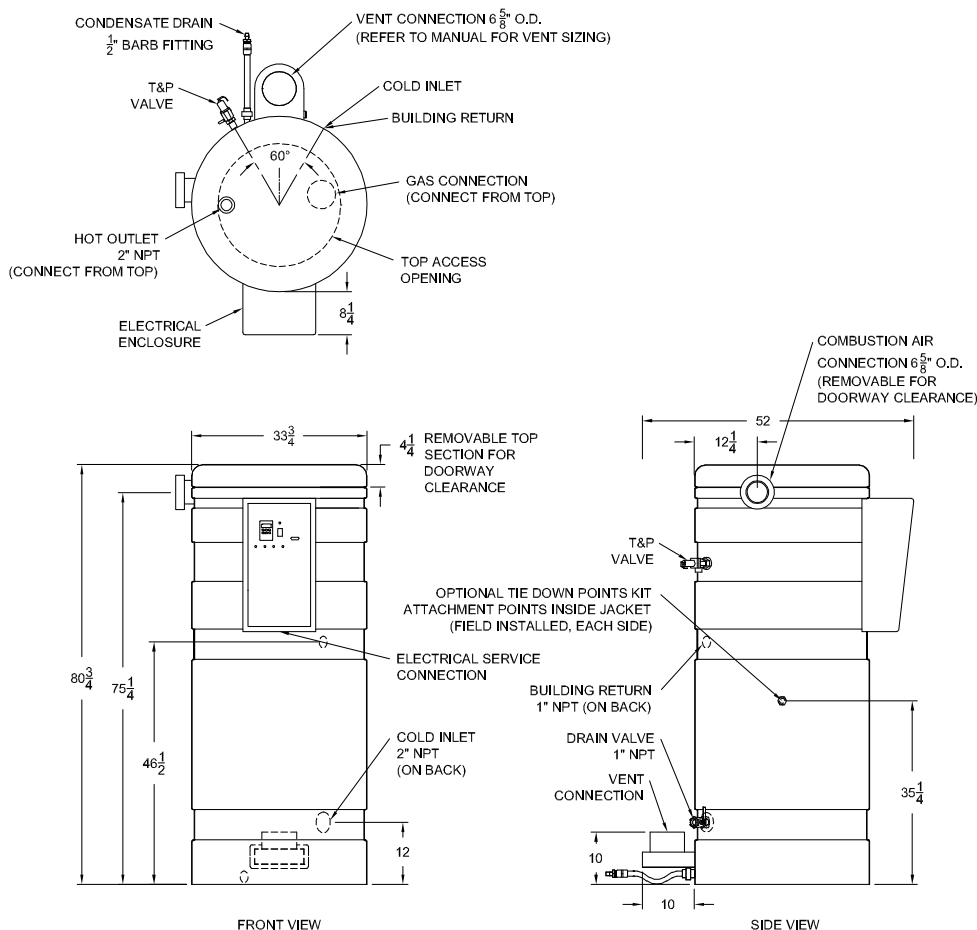
Zero clearance from sides and rear, 24" from front, 15" from top. Can be installed directly on a combustible floor.

Recommended Service Clearances

18" from all sides.
Check local and national codes for additional clearance requirements.

Emissions

All models < 20 ppm NOx.



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