GALLATIN GATEWAY SCHOOL DISTRICT PREBOND

Gallatin Gateway, MT

June 12, 2020

Assessment Report Draft

Prepared for/
Submitted to:
Gallatin Gateway School District
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Gallatin Gateway, MT 59730

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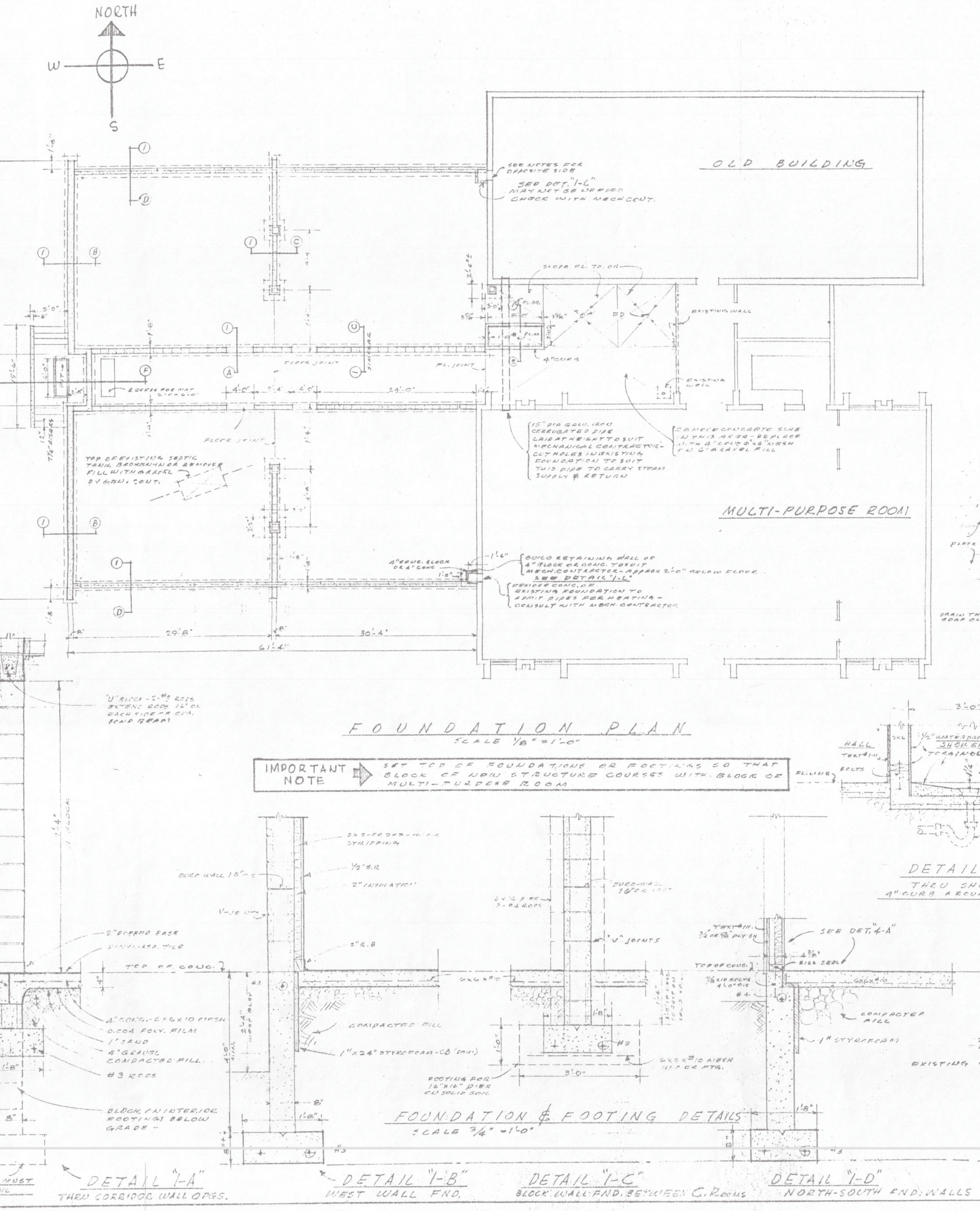

FOUNDATION PLAN

SCALE 1/8" = 1'-0"

IMPORTANT NOTE ➡ SET TOP OF FOUNDATIONS OR FOOTINGS SO THAT BLOCK OF NEW STRUCTURE COURSES WITH BLOCK OF MULTI-PURPOSE ROOM

DETAIL

THRU SHO

4" CURB AROU

FOUNDATION & FOOTING DETAILS

SCALE 3/4" = 1'-0"

DETAIL "1-A"

THRU CORRIDOR WALL OPGS.

DETAIL "1-B"

WEST WALL FND.

DETAIL "1-C"

BLOCK WALL FND. BETWEEN C. ROOMS

DETAIL "1-D"

NORTH-SOUTH END WALLS

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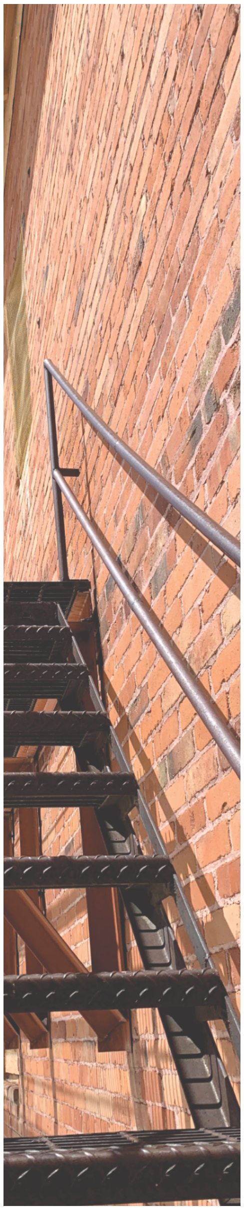

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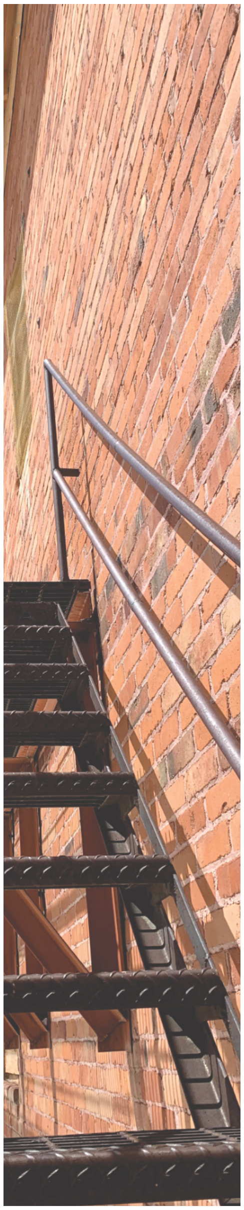
Introduction

Project Objectives & Methodology

Cushing Terrell and Martel Construction Design Build Team, along with DCI Engineers, were engaged with Gallatin Gateway School District to perform an on-site building assessment and prepare a report of findings in May 2020. to provide professional services to perform a condition assessment to study a programming effort for the Gallatin Gateway School.



Cushing Terrell & DCI Engineers visited the site on May 1 and 4, 2020 to examine the building and conducted visual assessments of the roofing, wall finishes, structural frame work, systems, and foundations, looking for apparent deficiencies. Cushing Terrell's assessment team was comprised of:

- Sky Cook, Cushing Terrell - Architect
- Chelsea Holling, Cushing Terrell - Historic Preservation Design Professional
- Alex Russell, Cushing Terrell - Mechanical Engineer
- Jeff Fain, Cushing Terrell - Electrical Engineer
- Sam Fox, DCI - Structural Engineer, Project Manager
- Risa Benvenga, DCI - Project Engineer

Cushing Terrell and DCI's efforts were aided greatly by assistance from the site staff.

Acknowledgments

Cushing Terrell and DCI acknowledges that no work is performed in isolation. Much of the preparation of this report included coordination with many individuals who have been intimately involved with the site over a number of years. Cushing Terrell and DCI thanks the following for their kind assistance with the preparation of this report:

- Theresa Keel - Superintendent
- Carrie Fisher - Business Manager

The participants listed above, Cushing Terrell, and DCI comprise the Gallatin Gateway School District team.

Illustrations

Unless noted otherwise, all photographs included herein have been provided by Gallatin Gateway School, Cushing Terrell, and DCI. The other images used throughout are credited accordingly. The drawings in this report were used from existing drawings from prior reports.

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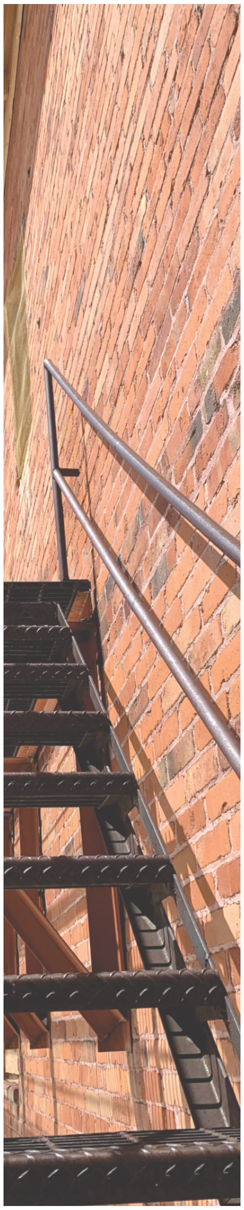
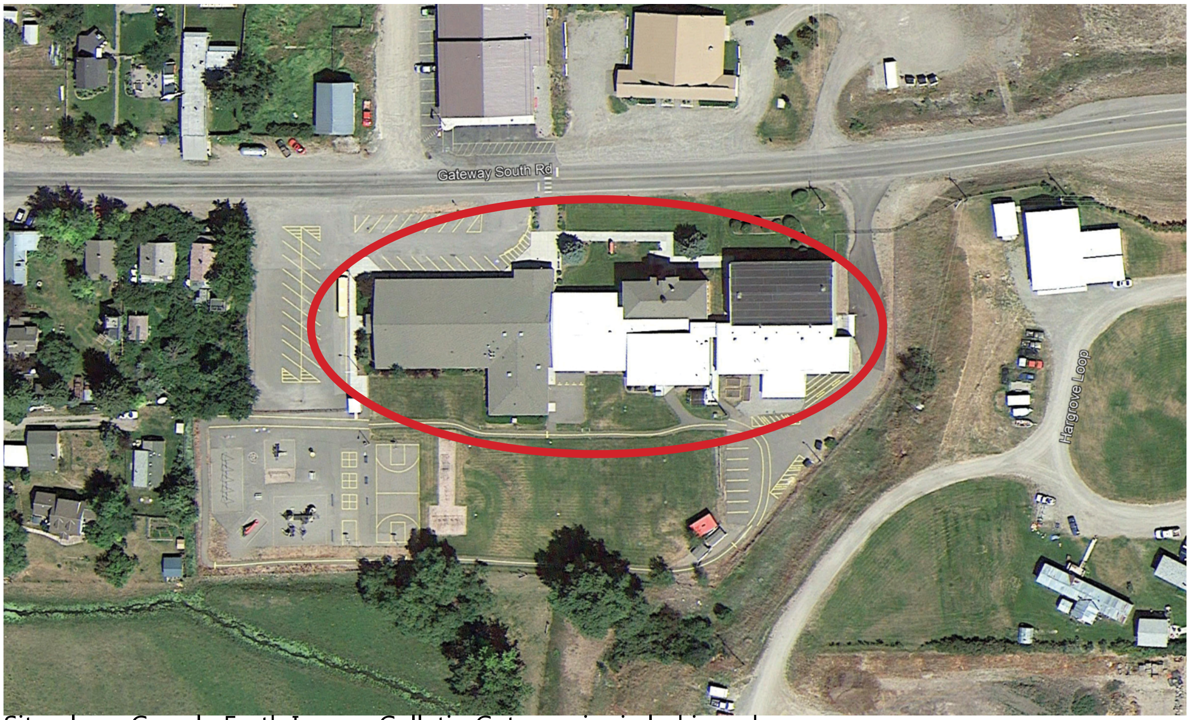
Executive Summary

Statement of Purpose of Assessment & Report

Cushing Terrell & Martel Construction Design Build Team, along with DCI Engineers were engaged with Gallatin Gateway School District to perform an onsite building assessment and prepare a report of findings in May of 2020. The scope of the assessment is limited to the review of visual elements, not including any investigative demolition or hazardous material testing. The intent of the report is to evaluate the current conditions for a high-level overview of the buildings architectural, structural, plumbing and mechanical, & Electrical systems. This includes verifying conditions previously found in reports completed by this team, as well as an outline of new deficiencies observed with recommendations for potential solutions. This report is created as part of the pre-bond planning process for Gallatin Gateway School.





Site plan - Google Earth Image, Gallatin Gateway is circled in red.

Site Challenges

The primary challenge of this site are due to pedestrian and vehicular circulation for pick up and drop off times, general wear in the asphalt near the playground, visual surveillance from interior to exterior, and building and site drainage which are directing water back to towards the building.

Summary of Findings

The Gallatin Gateway School was constructed with quality materials and portions remain in serviceable condition. The multiple era's of additions throughout the years have some building envelope repairs that are needed, as well as a roof replacement. Throughout the interior, safety and security upgrades need to be made in the Main Office area and exiting, to provide further security for the school; thermal comfort and ventilation in the classrooms need improved and updated HVAC systems; fire alarms need to be consolidated, non-serviceable electrical panels need replaced.

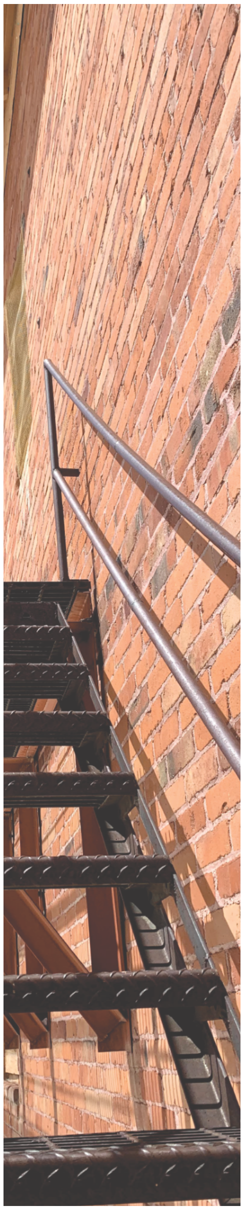
Additional details are outlined throughout this report and highlights from architecural, structural, mechanical/plumbing & electrical are provided in the executive summaries as follows:

In summary of the previous GGSD 2016 Building Assessment Report (see appendices for full report), there are elements related to code/life safety and building upgrades, that remain applicable. To bring the entire building in compliance with today's building codes, the following items are still recommended: Replacement of the non-rated corridor doors to 20-minute rated doors with closers and smoke seals, replacement of all non-rated glazing (doors & walls) in the corridors with rated/safety glazing, and the installation of an automatic fire sprinkler system (entirety of building). Additional items specific to the original 1914 building, if the use remains, are as follows: Add an interior fire-rated stairwell, re-work the fire escape to accommodate a second means of egress from the second floor, re-design of the bathrooms to make them handicap accessible, relocate the second floor storage, install an elevator for accessibility, replace the non-rated glazing in doors with safety glazing, patch & repair the holes in the upper floor rooms and re-paint, replace the run of stairs from the first floor to the main level of the building to have consistent riser heights & eliminate the tripping hazard, and re-glaze and repaint the original windows. Other exterior items to be considered on or adjacent the 1914 building include: brush off the efflorescence patches visible on the exterior brick walls, patch the failing mortar joints, adjust the irrigation system so it no longer sprays on the building, and reconstruct the fence and gate (at the exterior fire stair) to accommodate an opening sized for egress exiting. The 2016 Assessment overview provided above is supplemental to the findings included in the new 2020 Building Assessment Report.

- The combined building era's that make up the school campus are generally in serviceable condition. Most deficiencies identified are related to materials close to, or over, their lifespan. Life safety, building envelope, & safety/security items are the focus for prioritizing recommendations. Recommendations in the previous 2016 Assessment report still apply for the 1914 building, the Egress Assessment, & Safety Assessment. Additional emphasis toward items outlined in this report include the following.
- Exterior elements to prioritize include repair of the building envelope failures, such as filling in voids around windows, doors and exposed joints in CMU & brick wainscot walls. The mechanically fastened roof membrane appears to be close to its lifespan and should be considered for replacement. In addition, revising the fire exit stair discharge/roof access doorway for adequate exiting requirements and limiting unwarranted rooftop access is recommended. The additional interior building recommendations are to remove and replace the failing VCT flooring in the 2001 portion with a product suitable for the location. Safety and security review concludes that the main entry administration offices and lobby are disconnected from key opportunities of visual surveillance. Not being able to see visitors entering the campus and entry doors poses challenges and safety concerns for the school administration. Recommend to provide appropriate visual connections, a

secure entry lobby, as well as opportunities to shut portions of the school off to public access during after hour events, and provide adequate exiting.

- DCI Engineers performed a structural assessment based on those elements exposed to view and provided construction documents. In general, Gallatin Gateway School was found to be in good structural condition, with few areas requiring repair. Recommendations for voluntary upgrades were provided pertaining primarily to the lateral resistance of the structure. These recommendations can be completed as the structure is exposed for other purposes and remodeling. None of the recommendations included in this assessment require immediate action.
- The mechanical and plumbing systems for the school were assessed by Cushing Terrell so that recommendations could be made for improvement. The assessment consisted of reviewing original construction drawings, the Preliminary Engineering Report and Energy Audit authored by CTA in 2012, onsite assessments, and interviews with end users and the individuals maintaining the systems. Priority was given to those items deemed life-safety issues. Next level priority was given to items that would have the most significant impact on improving the learning environment and occupant satisfaction. The final level of priority are recommendations that would be desirable to implement if funding is available as part of the bonding effort today or can be added in the future as funding allows. The recommendations listed in each sub-heading below are not ranked by importance and can be shifted as deemed necessary by the school district.



Mechanical
- Highest Priority:
  1. No life-safety issues were observed.
- Recommendations for implementation:
  1. Update building Direct Digital Controls (DDC) supervisory controller.
  2. Improve thermal comfort and ventilation in the classrooms.
- Recommended for consideration:
  1. Update the entire building to modern Direct Digital Controls.
  2. Update the HVAC systems in all the remaining occupied office spaces of the building.
  3. Replace the Gymnasium Air Handling units with new units.
  4. Replace the cafeteria heating unit with a small air handler to handle ventilation, heating, and cooling.
  5. Replace the four existing boilers with new high-efficiency boilers.

Electrical/Fire Alarm/IT Infrastructure Upgrade Priorities in order of importance:
1. Upgrade and consolidate fire alarm system under a single manufacturer and location. Add mass notification functionality for campus wide audible messaging capability.
2. Replace non-serviceable/dangerous electrical panels and follow-up with a campus wide Arc Flash Hazard Analysis.
3. Address emergency lighting deficiencies throughout the school campus.
4. Provide separate, secured IT space with dedicated cooling/ventilation.

Property Information

Property Name:

Gallatin Gateway School

Property Location:

100 Mill Street, Gallatin Gateway, Montana 59730

Owner:

Gallatin Gateway School District

General Building Configuration & Orientation:

The Gallatin Gateway School fronts Mill Street with one access drive along the north.

Building Area:

Gallatin Gateway School: 35,136 SF (total)

Site Elevation:

4,953 Feet

Construction Dates:

1914, 1961, 1966, 1978, 2001, 2003

Building Use:

This building still operates as a school, serving elementary and middle school aged children, K-8 grades.

Report Organization

The report is organized in the following format:

1. Overview/ executive summary
2. Architectural assessment
3. Structural assessment
4. Mechanical assessment
5. Electrical assessment

An executive summary per discipline is included within each section, following with the conditions overview and recommended potential solutions for each discipline listed above.

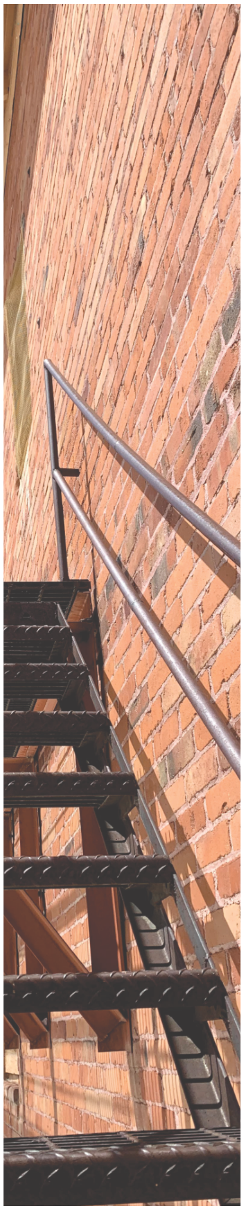
Reference to Previous Assessments & Documentation (See Appendices for Documents)

- Building Assessment (1914 Building), Egress Assessment, & Safety Assessment of Gallatin Gateway School- November 2016; prepared by CTA Architects Engineers & BCE Engineers.
- Preliminary Engineering Report and Energy Audit – May 2012; prepared by CTA Architects Engineers.

Building Assessment

General Building Descriptions and Alteration Timeline

In general, the alterations completed to the school remain similar as identified in the 2016 Assessment. Additional information is included below related to the building functions today.



1914

The original two-story school was constructed and remains at its original location. This structure includes a basement with two floors above. The 1914 school building contained four classrooms, four restrooms, one office, and storage areas. This structure was constructed using load bearing masonry walls and wood framed floor and roof assemblies. Construction type is III-B.

1961

The first single-story addition was constructed south of the original school. This included four classrooms, a multi-purpose room, and restrooms. Construction type III-B.

1966

The second single-story addition was constructed west of the original school and the 1961 addition. This included four classrooms with each pair of rooms sharing a small restroom. Construction type V-B.

1978

The third single-story addition was constructed to the east of the 1961 addition. This included a gymnasium, locker rooms and two classrooms. Construction type III-B.

2001/2003

The fourth and most recent addition constructed was built to the west of the 1966 addition. This included six additional classrooms, restrooms, administrative offices, library & computer lab. Additional restrooms were included as an alteration south of the locker rooms on the far east side of the building. Construction type V-B.

Architectural Assessment

Overview

The combined building era's that make up the school campus are generally in serviceable condition. Most deficiencies identified are related to materials close to, or over, their lifespan. Life safety, building envelope, & safety/security items are the focus for prioritizing recommendations. Recommendations in the previous 2016 Assessment report still apply for the 1914 building, the Egress Assessment, & Safety Assessment. Additional emphasis toward items outlined in this report include the following.

Exterior elements to prioritize include repair of the building envelope failures, such as filling in voids around windows, doors and exposed joints in CMU & brick wainscot walls. The mechanically fastened roof membrane appears to be close to its lifespan and should be considered for replacement. In addition, revising the fire exit stair discharge/roof access doorway for adequate exiting requirements and limiting unwarranted rooftop access is recommended. The additional interior building recommendations are to remove and replace the failing VCT flooring in the 2001 portion with a product suitable for the location. Safety and security review concludes that the main entry administration offices and lobby are disconnected from key opportunities of visual surveillance. Not being able to see visitors entering the campus and entry doors poses challenges and safety concerns for the school administration. Recommend to provide appropriate visual connections, a secure entry lobby, as well as opportunities to shut portions of the school off to public access during after hour events, and provide adequate exiting.

Introduction

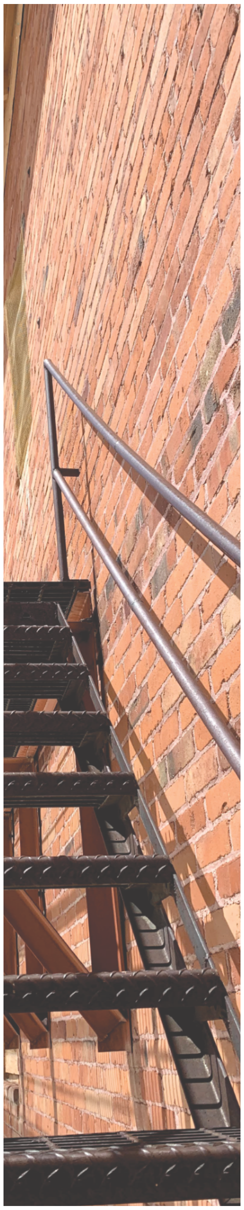
The intent of this architectural assessment is to provide a general high-level overview of existing building conditions, deficiencies, additional basic CPTED safety & security review, and any immediate needs or recommendations from the assessment results.

Joint Failure at CMU walls.

Wear of skyward joints along west wall.

General Conditions Statement

See Appendices report "Building Assessment (1914 Building), Egress Assessment, & Safety Assessment of Gallatin Gateway School-November 2016; prepared by CTA Architects Engineers & BCE Engineers.", supplemental to the assessment information below.



Exterior Assessment

Foundation

- The 1914 building findings are included the 2016 assessment are still applicable today.
- Visible portions of foundation for the remaining building portions are concrete and appear to be in serviceable condition.
- Recommend routine building & site maintenance continue.

Exterior Walls

- General - The 1914 building findings are included the 2016 assessment are still applicable today.
- Additional exterior siding materials include CMU block, Masonry veneer wainscot, & Fiber-cement (Hardie-board) lap siding.
- CMU walls – generally in serviceable condition with some areas of failure.
  - Portions on the south elevations show joint failure and recommend replacement of backerrod and sealant.
  - One significant area adjacent the kitchen double doors is fully exposed interior/exterior and should be filled with insulation/backerrod/sealant to fully conceal gaps present.
- Masonry veneer wainscot – generally in good condition.
  - Some efflorescence is apparent on the southwest and west elevations – this is occurring where adjacent where the weep holes are. The weeps appear to be working but some moisture trapping is occurring due to the efflorescence visible. This is something to keep an eye on, if rapid increase in efflorescence is present recommend further investigation.
  - Top course of masonry at wainscot – generally good condition, with failure at one elevation. The West elevation top course of brick is showing wear at all skyward joints and bricks are spalling. Recommend re-pointing of all joints, replacing bricks that are beyond repair, and additional flashing to cover the skyward surfaces on this elevation.
  - The North and South elevations have masonry joints failing at wainscot – remove as required and reapply backerrod with new sealant for full distance of joint.
- Fiber-cement (Hardie-board) lap siding – generally in good condition at all locations

Joint Failure at masonry walls.

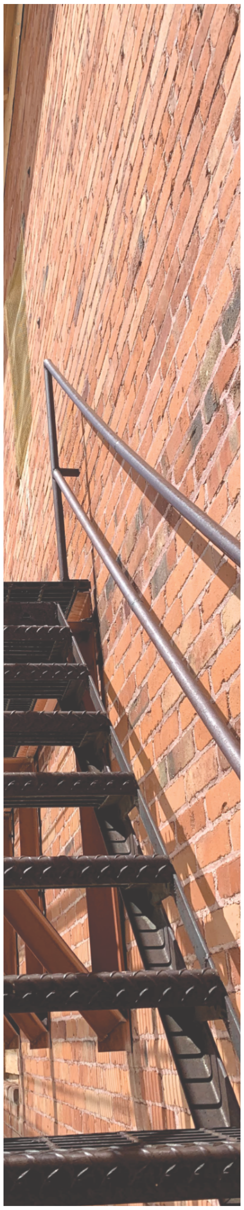
Windows & Doors

- General - The 1914 building findings are included the 2016 assessment are still applicable today.
- Wood windows – typically in serviceable condition.
    - Paint at wood mullions is failing at all locations – recommend to scrape and paint all exposed faces to conceal wood from the elements.
    - Perimeter sealants revealing voids – recommend to fill visible voids with backerrod and sealant.
    - 1966 portion classroom windows – appear to have additional layer of siding and trim around windows without still flashing. The trim around the windows does not allow for consistent directional flow down/out from siding. Concern with water/moisture being trapped between old and new materials causing failure at perimeter of windows. If interior leaking is present, recommend further investigation of these windows. Otherwise fill voids present with backerrod and sealant.
- Metal windows – typically in serviceable condition.
    - Perimeter sealants revealing voids – recommend to fill visible voids with backerrod and sealant.
    - South elevation – music room exterior – window doesn't fully close/latch and can open it from the exterior. Recommend addressing this immediately, to remove an uncontrolled access point.
- Hollow metal doors – generally all exterior doors are hollow metal type and in good condition with minor wear.
    - The door opening at the kitchen/cafeteria is not fully concealed – gaps present at head and jamb. Provide backerrod and sealant. Confirm steel lintel support is adequate for opening with CMU joints exposed.

Additional layer of siding at windows.

Gaps around door opening.

Roof



- General - The 1914 building findings are included the 2016 assessment are still applicable today.
- Two types of visible roofing material are used across each of the building eras: Asphalt shingles, & a mechanically fastened white membrane roofing product.
- The asphalt shingles appear to be in good standing condition.
- The membrane roofing shows wear at seams along with some organic growth scattered across entire surface, and portions of sealant are receding at termination bar on vertical surfaces. This product is nearing its typical lifespan.
  - Recommend to verify the installation date of the original membrane product to confirm lifespan, and replace sealants as needed until new roof installed. When new roofing is applied, verify if existing roofing layers reside below with core samples, (potential for hazardous materials from original construction).
- Wood fascia at all locations of the 1960's & 1978 portions are failing with portions of paint and wood flaking off.
  - Recommend to scrape and re-paint all exposed faces to conceal wood from the elements.
- If not done so already, prior to any construction or modifications at these locations, recommend testing the existing roofing portions from the 1960's & 1978 additions for hazardous materials.

Roofing material over building additions.

Site & Miscellaneous

- General - The 1914 building findings are included the 2016 assessment are still applicable today.
- The west of gymnasium roadway grading has been revised to shed away from the building for positive drainage with new asphalt paving down to the kitchen area.
- Other areas of the site are showing additional wear.
  - The southwest corner of the building – manhole area – asphalt is failing and an 8" diameter hole is visible adjacent the manhole. This could present a hazard being adjacent the playground area.
- Site circulation for pedestrian and vehicular traffic presents challenges for pick up and drop off times. Students crossing vehicular paths to entrance.
- Exterior freezer- a standalone exterior walk in freezer is located on the south elevations.
  - The flashing connecting the north side of this cooler if failing. If the cooler remains, recommend applying new flashing with counter flashing strip to fully conceal gap between the building and cooler.
- Downspout concrete bases – typically along the south elevation need addressed – they slope back pushing all downspout water toward the building. Re-grade below each of these to provide positive drainage (away from building).

Worn asphalt around drain.

Concrete base directing water back towards building.

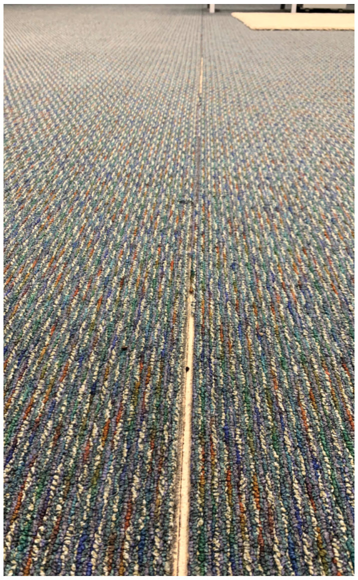
Interior Assessment

General

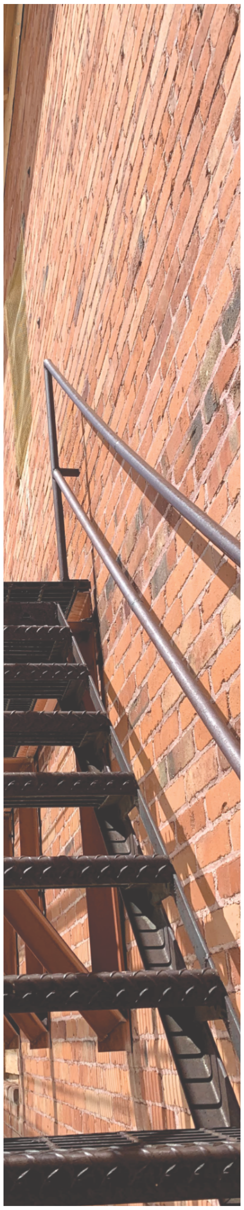
The 1914 building assessment, egress assessment, & safety assessment related to the interiors are included the 2016 assessment are still applicable today. Additional items outlined below are supplemental to that information.

Floors

- General – a variety of flooring types exist throughout the school and conditions vary from good/ serviceable conditions to failing.
- Wood flooring – at gymnasium and the multi-purpose room appears to be in good condition overall.
- Plank luxury vinyl tiles (LVT) & Sheet vinyl flooring– this is the newest flooring product applied to select areas of the building (art room, locker rooms) and is in good condition.
- Carpet - generally in serviceable condition overall.
    - Offices, admin area, and Library show some wear marks and minimal areas of stains on carpet.
    - Classrooms in the 2001 portion have failing seam lines/gaps with carpet roles. Recommend filling or fully replacing if this is a hazard or limits chair and desk movement needs for student seating.
- VCT tile floors – majority of VCT tiles are failing & subfloor is warped within the 2001 addition. This occurs throughout the main entry lobby, corridor to the west, and one classroom. Recommend to remove all and replace with new flooring and subflooring as required during removal process.
    - VCT tile in 1960's and 1978 portions appears to be in serviceable condition. Recommend reviewing the existing hazardous materials report the school district has prior to any construction modifications to the flooring in these areas.
- Tile flooring – general in good condition and locations are limited to restrooms in 2001 addition.
- Kitchen flooring – sheet vinyl product – shows wear at all floor drains and subfloor appears to be warping. Recommend to confirm cause of warping subfloor (below or above subfloor saturation) and remove & replace subfloor and sheet vinyl product so floor can slope toward floor sinks.



Failing seam lines in carpet.



Failing VCT tiles.

Failing VCT tiles.

Interior Walls

- General – interior wall types throughout the building are generally in serviceable to good condition.
- CMU walls – with in the 1960's and 1778 portions are generally in serviceable conditions. See exterior CMU wall type notes for more detail.
- Gypsum board/framed walls – generally in good conditions. Classrooms typically have minimal areas of dents/scrapes at wall finish. The locker room walls show most damage and is typically around corners. Recommend patching and painting locations as well as installing corner guards on high traffic locations with damage present.

Ceilings

- General – most ceilings throughout the building were in good condition with the serviceable areas noted below.
- Gymnasium ceiling plaster – has joint line cracks present. Patch and re-paint as necessary.
- ACT ceilings – minor concentrated damage to tiles and grid in a few areas: main office area reception, west most vestibule in 2001 portion.

Interior Doors and Windows

- General – see 2016 assessment report for limited code and exiting information.
- Doors in the 1966 portion do not meet current ADA standards. If work is done in this area clearances will need addressed.
- Recommend to revisit all interior classroom door hardware throughout the building to provide levers, along with doors/hardware related to building separations if any construction modifications are done. Needs are not currently met with alterations presently in place.

Concentrated damage at ACT ceiling.

Revisit door hardware.

Restrooms

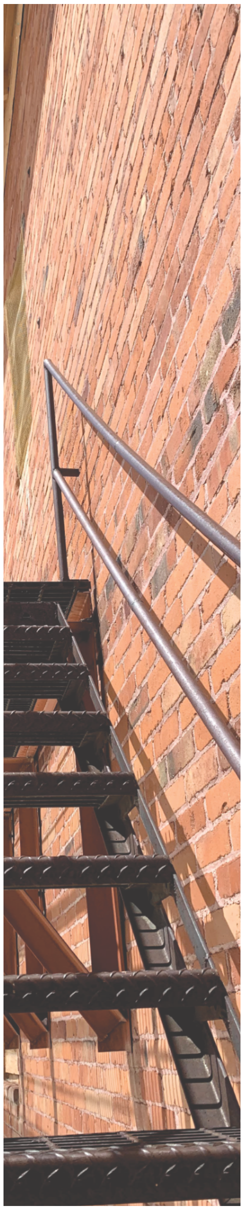
- General – restrooms throughout the building were in good condition with the serviceable or non-compliant areas noted below.
- The group restrooms previously noted in the 2016 assessment as deficient (located in the 1978 portion) were recently remodeled to be ADA compliant with all new finishes and fixtures.
- Single user restrooms - in 1966 portion are not ADA compliant. If work is done in this area consider updating these to be compliant.

Stairs

- General – see 2016 Assessment report, no additional areas to report.

Miscellaneous

- Gymnasium bleachers – current bleachers are no longer functioning/retractable and do not provide adequate space between court lines and spectators. Additional exiting deficiencies related to this area need further review – see 2016 assessment report.



Gymnasium bleachers.

Safety & Security Review - Crime Prevention Through Environmental Design (CPTED)

Overview

Overall the Safety Assessment included the 2016 report is still applicable today. Additional school Safety & Security elements are outlined below. This information was gathered through discussion with the Superintendent and Business Manager as well as through assessment.

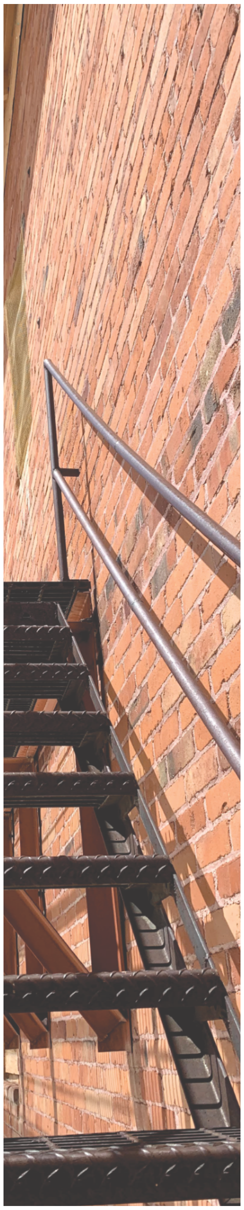
Risks or Opportunities that Students Encounter Between Home and School

- Crosswalk at Mill Street is frequently used at beginning and end of school day. The walking tunnel under Hwy 191 is also highly used
- A cross walk guard is stationed at these times
- Weather permitting most students walk, or ride bikes to school, bike parking at front of 1914 building
- Primary mode of transport is parent drop off/pick up
    - current layout creates hazards for students crossing vehicular access areas
- Busses are available, but the least used mode of transport
- No significant traffic related to school field trips or special instructions
- Current student dismissal policy is getting revised by SD
    - Desire for flashing light at cross walk
- Confirm if traffic study was completed
- Exterior surveillance cameras are provided at each general building elevation
- Recommend to look into how natural surveillance can be improved

Overall image of north portion of the site.

Risks or Opportunities in Areas Directly Adjoining School Properties

- No major concerns currently with adjoining traffic, crime, or other hazards at this time
- A perimeter fence boundary is in place around school property with the exception of elevation along Mill street due to the parking area access
- External lighting is provided along perimeter of building – generally is adequate and on automatic timers
- Currently no site signage to identify a separation for parking and student access to building
- Recommend identifying appropriate site & building signage for, during school & after hours events (i.e. gym) access routes
- Student congregation on site is typically in exposed areas
    - Challenged areas include the exit stair / roof access area



Staff Observation Ability of Visitors Prior to Reaching the School Entry & Outsiders Looking In

- This is currently one of the largest safety concerns for the main entry area
    - Administration/Superintendent office has very limited view triangle to the exterior entry (a single direction view out a window)
    - The front office has no visibility to the exterior main entry
    - Neither have visibility to the entry vestibule doors
- Recommend a deeper look into the visual connections and natural surveillance at main entry procession into the site and entry doors
- Outsiders looking in have limited visibility with the mirrored glazing for the newer portion – and have more visibility throughout classroom windows for the remainder building eras
- The south elevation – cafeteria and lobby area have exit doors to the playground used by students and staff
    - The long corridor with these exits have limited visibility & blind spots that creates safety challenges
- The fire exit on the 1914 building also presents challenge for outside traffic on premises/roof
    - After hours issues occur with the open access to the roof/exiting stair (east side of 1914 building) and getting on top of the roofs. Also, the southwest portion of the gym roof is low and can easily be accessed with slope of roadway adjacent
- Delivery to the building is limited to the main entry doors or routing back to south elevation toward playground area
    - Not an adequate location currently – mixed traffic for deliveries & students/staff
    - Site challenges adjacent to playground provides limitations at other delivery location (cafeteria doors)

Staff Member's Lockdown Capability in Classrooms and Other Locations

- School has plan in place for lockdowns
- Staff has capability to lock classroom doors –
    - the 'door buddy' cover found on most classrooms is a potential hazard for function of hardware on doors and intent for lockdown scenarios
- If doors are not locked staff have to step into hall to lock them prior to closing
- Door position varies for classrooms – depending on thermal comfort or acoustic needs at time of use
- Telephone/intercom system is set up for all staff to have communications through their cell phones
- Limited classrooms have emergency secondary exit to the exterior (1966 portion)

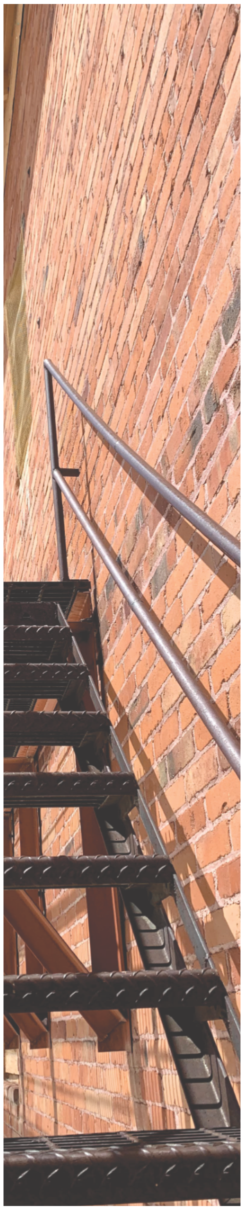
Overall, School Climate Pro-Social Aspects

- Generally students and staff feel safe onsite
- Regular bullying occurrences are present, but don't typically have excessive levels
- Student populations generally interact well
- Desire for a special needs cool down room – neutral zone not currently provided – is shared space

Identifiable or Predictable Trouble Spots, or High-Risk Locations on Premise - the Summary is the Addition to Items Outlined Above

- Climbing hazards – fire escape, roof access locations present hazard
- Driveways and loading/receiving – shared with main entry & at playground, access concerns
- Main entry / main office – high level concern with no visibility prior to entry
- Hallways – by gym, music, and locker rooms – no visibility from remainder of school, limited to no surveillance
- Classrooms – ventilation on north elevation is issue adjacent to parking lot/ vehicle exhaust
- Gymnasium – in adequate seating and space for functions, exiting code issues
    - Space is used as multi-use for school functions
    - No dedicated auditorium or performance space (i.e. stage)
- Locker rooms – each locker room has a small vestibule space to the secondary exit/exterior door with no surveillance to this area
- Cafeteria/kitchen – windows adjacent corridor (school generally doesn't have issues noted)
- Art room – ADA concern/accessibility issues to access/use room
- Science labs – limited use available – room serves as general learning classroom too
- Library – has limited public use due to size (pre-school occasional use)
- Music room – location is remote compared to rest of classroom spaces
    - Corridor access to the space has limited surveillance

- Technology classroom – shared with math lab, limited use available – room serves as multi subject classroom
- Custodial storage – is shared with boiler room, not enough room currently for custodial – custodial/sink adjacency to electrical is concern
- Time-out/cool down room – none provided, one desired
- Meeting or conference rooms – not enough space to accommodate current needs for administration/staff,
- Faculty break & work rooms – no separation provided, is shared space with conference and main office entry area
- Nurse office & sick room– no privacy here, is shared with main office open area and highly visible
- Roof – outside access is concern on west elevation
- Portable buildings – one provides storage for busses & one for exterior use items
- Key control – All exterior doors are locked typically. Primary exterior doors have key fob/card access for staff. Main entry is open during school hours. Custodial locks down school each day – access control door locks are on timers. Interior doors are all keyed access. Keys are controlled by Superintendent and Business Manager.
- Lockbox – is provided at front entry – volunteer fire station is across the road form school
- Gates in corridors – don't function fully to close of portion of building, inadequate
- Building exiting routes – don't allow for closing down portions of building during afterhours use – issues with gates in corridors, restroom access adjacent after hour spaces used, and direction of door swings are limiting opportunity
- Agriculture classroom/lab – greenhouse & planters on site used for curriculum
- Outside service provider for lawn/site maintenance – no site equipment storage provided
- Storage – generally school is short on storage: custodial, gym storage, and general storage.



Conclusion & Recommendations:

Overview of recommendations for deficiencies are outlined below.

- The previous 2016 Assessment report recommendations still apply for the 1914 building, the Egress assessment, & Safety Assessment.
- Prior to any work commencing in the 1914, 1960's, and 1978 portions of the building, materials, if not already done so, should be tested for any hazardous content (i.e. lead or asbestos). These elements are common to the construction era's and the school district does have some testing data from previous investigations completed.
- Primary Safety and Security items should be addressed: the main entry procession for visual connections, secure entry lobby, as well as providing opportunities to shut portions of the school off to public access during afterhours events.
- Revise the fire exit stair and door to obtain roof access for adequate exiting requirements and limiting unwarranted rooftop access.
- The exterior building materials are generally in serviceable conditions. Focus toward the repair of building envelope items, i.e. backkerrod and sealants around windows, doors and exposed joints in CMU walls recommend addressing sooner than later.
- Consider replacement in the near future of the mechanically fastened white membrane roofing areas.
- The additional interior building recommendations are to remove and replace the failing VCT flooring in the 2001 portion with a product suitable for the subfloor/structure and traffic associated with this area.

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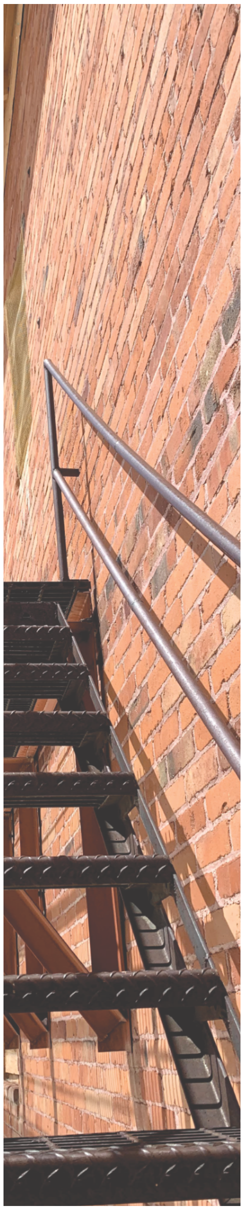


Structural Assessment

Overview

DCI Engineers performed a structural assessment based on those elements exposed to view and provided construction documents. In general, Gallatin Gateway School was found to be in good structural condition, with few areas requiring repair. Recommendations for voluntary upgrades were provided pertaining primarily to the lateral resistance of the structure. These recommendations can be completed as the structure is exposed for other purposes and remodeling. None of the recommendations included in this assessment require immediate action.

Introduction

The intent of this investigation was to determine the general structural status of the Gallatin Gateway School Building as a whole and develop recommendation for necessary structural retrofits. It is our understanding that this report will be used for reference in future remodel or upgrade efforts. Gallatin Gateway School has had multiple additions and upgrades over the years. The current building consists of the original 1914 brick building along with additions from the 1960's, 1970's, and 2000's. The exterior walls of the school consist of a mix of concrete masonry units (CMU), both in running bond and stack bond, brick, and wood framing. The roof structure is a combination of different types of wood framing.

Each section of this report has been separated to describe each of the additions of the building by era. These have been identified and separated as the original 1914 building, the 1961 and 1966 additions, the 1978 addition, and the 2003 additions, which have been labeled on a floorplan of the building in Figure 1.

Method of Investigation

DCI Engineers completed a structural conditions assessment for the Gallatin Gateway School Building as part of an overall building assessment. Samantha Fox, PE, SE, and Risa Benvenga, EI, visited the site on May 5, 2020 in order to assess the condition of the structure. The on-site investigation was by visual observation only

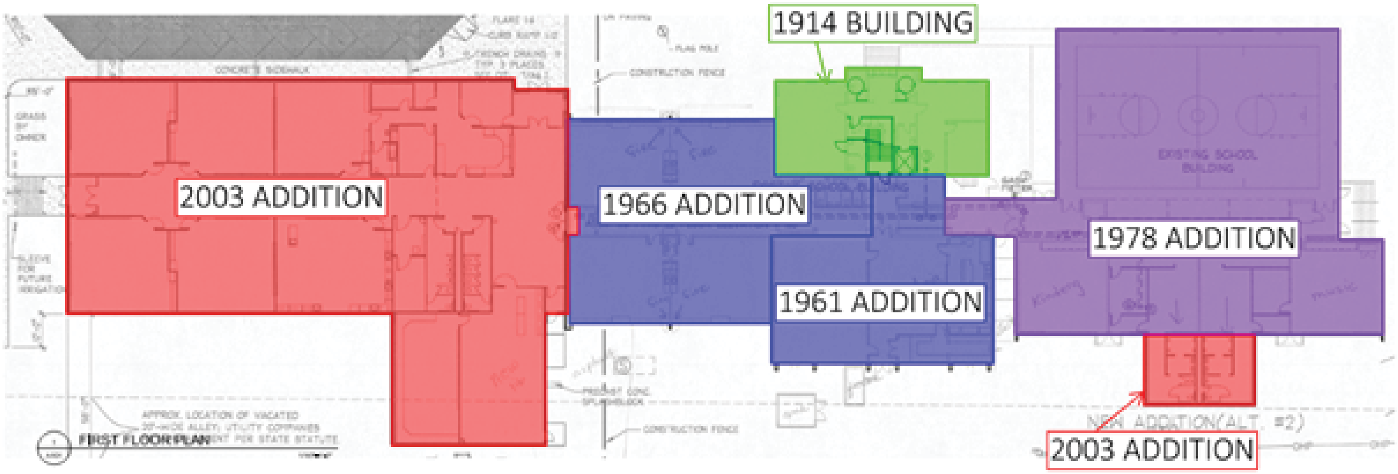
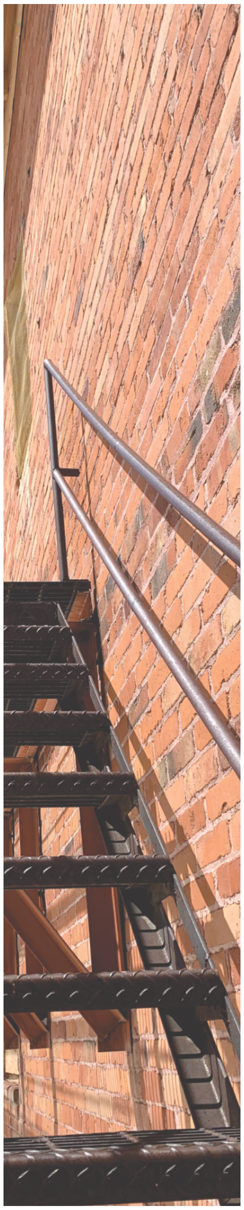


Figure 1 - layout of Gallatin Gateway School Additions.

and limited to those structural elements that were exposed to view. No destructive investigations or materials testing was performed at the time of the visit. Assumptions were made concerning the elements that could not be observed directly based on our understanding of the surrounding structure and our experience with buildings of a similar nature.

Various construction drawings from the life of the building were made available for our use. Most notably, the construction drawings for the 1966 classroom addition, the 1978 gymnasium addition, and the 2003 classroom and locker room additions were reviewed and referenced for the applicable areas within the school. Based upon observations during our site visit, these documents appear to be in agreement with the actual construction of the building.

In 2016, DCI Engineers (then BCE Structural) conducted a thorough structural assessment of the 1914 building. This previous assessment included documentation of the structural framing and connections within the building and presented recommendations and necessary upgrades to the original building. During our investigations, this report was used as a baseline for the condition and structure of the 1914 building and should be referenced with regards to that area of the school.



Structural Observations

Gallatin Gateway School is primarily constructed of CMU walls with the exception of areas of the 1966 addition and the original structure. The roof structure is a mix of glued-laminated timber beams, wood rafters, and wood trusses. The exterior walls of the building appear to sit on either concrete or CMU foundation walls that extend below grade and the main floor is a mix of concrete slab on grade and wood framing over a crawlspace. The majority of the structure is single story, but the original building also has a basement and second floor, as discussed below.

1914 Original Building

The original structure is a two-story brick building with wood framed floors and roof. The roof consists of 2x6 wood rafters spaced at 24 inches on center. The rafters span from the exterior brick walls to a ridge or hip board. The cupola located on the roof of the building is constructed of 2x bearing walls that are supported by the roof rafters. The first and second floors are constructed of 2x12 members at 16 inches on center. At the second floor, the members span the width of the building, bearing on the exterior brick walls. There were no obvious signs of failure observed in these areas.

At the first floor, there is an intermediate beam that supports the floor framing. Timber columns support the beam and bear on the concrete slab on grade in the basement. The basement walls consist of 14-inch-thick cast in place concrete. Original windows in the concrete walls have since been infilled with CMU or wood framing. These walls were found to be in overall good condition. There were no signs of cracking that would indicate settlement. The basement floor showed signs of cracking and there were signs of water infiltration at the concrete walls.

Please reference the 2016 report for further information and a more thorough explanation of structural concerns and recommendations. Conditions during the 2020 site visit had not changed significantly since the 2016 report was issued.

1961 and 1966 Additions

The cafeteria structure was constructed in 1961. The 1966 addition included the classrooms and bathrooms located to the west of the original building.

The cafeteria consists of large tapered glued-laminated (glulam) beams that were measured as at least 21 inches deep from the bottom to the roof framing. These beams span from the north to south walls at 12 ft on center and support horizontal planking, seen in Figure 2. All four perimeter walls are CMU placed in stack-bond with a concrete slab-on-grade floor. All observed structural elements appeared to be in good condition.

Figure 2 - roof framing in Cafeteria.

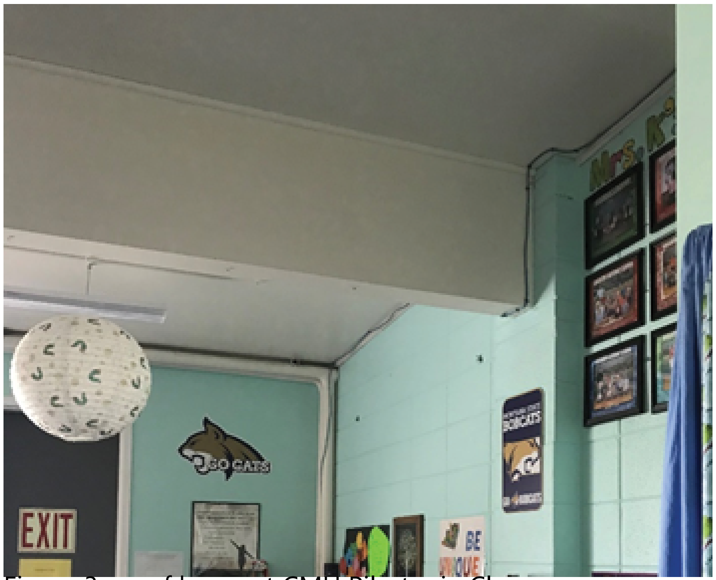
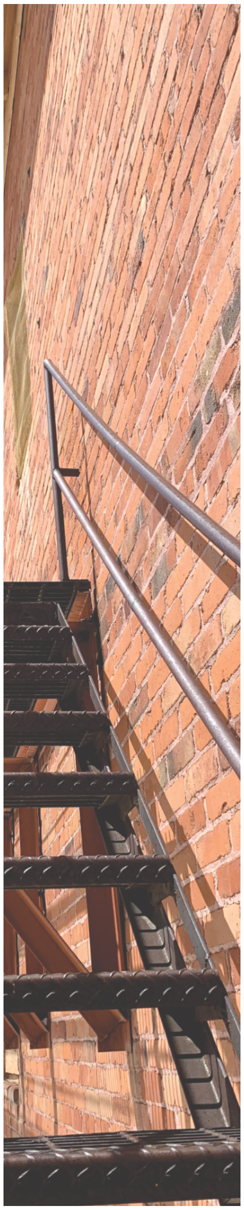


Figure 3 - roof beam at CMU Pilaster in Classroom.

The classroom area roof consists of plywood sheathing over 2x8 woods joists at 16 inches on center that span in the north-south direction and are supported by the CMU hallway walls, glulam beams, and the exterior wood walls.



The north and south exterior walls of this addition are wood framed 2x4 stud walls on a concrete foundation wall and strip footing that extends to frost depth. The west wall, which was also exterior at the time of construction, is stack-bond CMU and is also supported by a concrete foundation wall that extends to frost depth. The interior walls on either side of the main hallway are stack-bond CMU supported on concrete footings below grade. The main north-south walls that divide the classrooms are also stack-bond CMU with pilasters at the third points. These pilasters support glulam beams that parallel the hallway walls and form the main support system for the roof structure, seen in Figure 3.

Visible elements of the roof structure appeared to be in good condition and there were no signs of overstress. The CMU walls also appeared to be in good condition overall. The only notes damage of structural concern is a larger crack at the interface between the 1966 addition and the 2003 addition. This crack was most likely cause by the rigid connection between the older and newer CMU walls. The foundation wall was retaining soil prior to the 2003 addition, and there may have been foundation movement during the excavation process paired with the rigid connection is likely the cause of this cracking. Figure 4 shows the cracking that is occurring at the top of the wall along one of the vertical joints between the CMU blocks as well as one that extends through at least three blocks.

Figure 4 - CMU wall cracking at addition interface.

1978 Addition

This addition was constructed in 1978 and included the gymnasium and four additional classrooms. Two of these classrooms have since been remodeled to serve as the current boys' and girls' locker rooms. The exterior walls of this addition are all running-bond CMU on concrete foundation walls extending to frost depth. The floor in this area is concrete slab on grade. The interior wall of the gym is also running-bond CMU with large openings for the moveable bleachers. All other load-bearing interior walls appear to be wood framing.

The roof structure could not be observed in this addition as all of the accessible areas were covered in gyp board. Based upon the provided drawings it is believed to be open web wood trusses, specified as TJL's at 24 inches on center over the gym and the classrooms. The roof framing over the hallway is 2x8 wood joists at 24 inches on center.

Overall, most observed elements appeared to be in good condition. Cracking of the gyp board is present at the ceiling tracks for the bleachers (Figure 5), but the structure above the drywall could not be verified or observed. No structural information was available on the provided documents for the support system of the moveable bleachers in the gym.

2003 Additions

The 2003 additions included classrooms, the library, and the front administrative offices as well as the expansion and conversion of two classrooms from the 1978 addition into locker rooms.

The locker room addition has running-bond CMU walls at the exterior that bear on concrete foundation walls to frost depth with a concrete slab on grade floor. The roof framing could not be verified but consists of open web wood joists at 24 inches on center covered by plywood sheathing according to the structural drawings. All visible structure appeared to be in good condition.

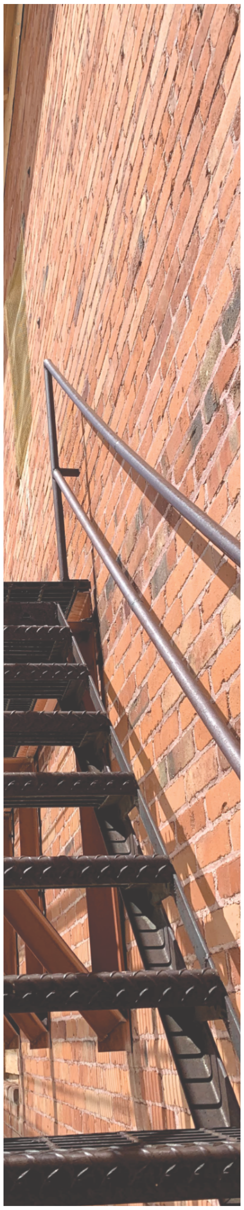
Figure 5 - cracking at Moveable Bleacher Track

The classroom and library section of the addition is constructed of wood roof trusses with plywood sheathing. Again, this framing could not be verified at the time of the visit but is reflected in the construction documents. These trusses bear on the interior hallway walls and on the exterior north and south walls in the classroom area. At the library, the roof framing changes direction and bears on the exterior east and west walls of the area.

The exterior walls are all wood framed 2x6 walls that bear on a concrete foundation wall that extends to frost depth. With the exception of the mechanical room area, the floor consists of 11 7/8" BCI 450 wood I-joists at 16 inches on center under classrooms and 12 inches on center under the main hallway. These joists span between wood stud walls that bear on concrete strip footings in a crawlspace area, as seen in Figure 6. The wall at the interface with the 1966 addition is a running-bond CMU wall that is flush to the stack-bond CMU wall.

The mechanical room is supported on running-bond CMU walls that bear of strip footings in the crawlspace. The floor could not be verified during the site visit but is shown to be a concrete slab on metal deck that spans between CMU walls.

All observed elements appeared to be in good condition. No signs of overstress or failure were apparent during the site visit.



Structural Code Review and Recommendations

This investigation was based on the life-safety requirements set forth in the 2018 International Existing Building Code (IEBC) and the 2018 International Building Code (IBC). Gallatin Gateway is considered as area of high seismicity, and the school is considered to be in Seismic Design Category D. In addition, a 48 pounds-per-square-foot (psf) ground snow load is used in current building design for the area, according to the Montana Ground Snow Load Finder.

Figure 6 - crawlspace framing.

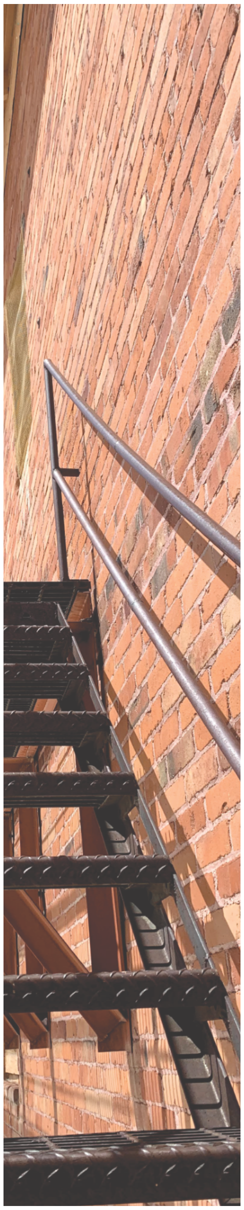
In general, the school structure was found to be in good condition. There were few signs of deterioration, damage, or overstress observed during the site visit.

The exterior CMU walls in the 1960's and 1970's additions and the exterior brick walls in the original building would likely not meet the current code requirements for a design-level earthquake; however, the structure has been performing adequately throughout the history of the building and is not considered in need of any major immediate repairs.

Per the IEBC, no lateral or gravity upgrades are required if the structural elements of the building are not altered or removed. In general, the IEBC allows for minor changes and alterations to the structure without upgrading the entire gravity or lateral systems to current-day code standards. These allowances are in place to recognize that the building has served its purpose for a similar use and has performed well in the past. Any structural upgrades to the building performed as part of a remodel would be considered voluntary unless triggered by alterations to the existing structure. These triggers include a change of occupancy, modifications to more than 33% of the structure, an addition of load or reduction in capacity of specific members or significant changes in the load path. The following recommended voluntary upgrades are intended to increase the life-safety and reduce structural and architectural damage to the building in the event of a design-level or smaller earthquake.

We do not anticipate the future remodel effort to trigger any mandatory IBC-level upgrades for the building. However, we do anticipate some level of alteration to the existing structure for architectural or mechanical upgrades. These could include new openings in existing bearing walls and support for new mechanical units on the existing roof structure. As long as these alterations remain minor, they will not trigger a full upgrade of the existing building but will require some localized structural upgrades.

1914 Original Building



The recommendations laid out in the 2016 structural assessment are still considered relevant and the best course of action for this structure. As a summary, the recommendations given in the previous report are as follows:

The roof structure is deficient to support the existing gravity loads (including snow) and should be retrofitted to ensure failure does not occur in a design snow event. This could consist of new ridge and hip beams and new elements 'sistered' to the existing rafters for added capacity.

The addition of plywood sheathing to the roof diaphragm to increase the lateral load resistance is recommended. In addition, supplemental connections between the roof framing and the exterior brick walls

New bearing wall elements or a new beam should be added at midspan on the second-floor joists to increase the capacity of the floor to current day design loads. At corridor locations, joists would need to be 'sistered' to further increase the capacity for the higher loading.

The beam supporting the first-floor joists requires an upgrade for the current design loads. This could take the form of 'sistered' members. An upgrade to the column-to-beam connections was recommended to ensure the elements do not come disconnected during a seismic event.

Steps to remediate the observed water infiltration should be taken to ensure that the foundation walls stay in good condition. Coordination with a geotechnical and/ or civil engineer is recommended to solve this issue. In addition, the concrete slab in the basement is not of structural concern but can be leveled if the cracking becomes a serviceability issue.

Please refer to the 2016 structural assessment report for a full list of recommendations and greater detail as to specific proposed solutions.

1961 and 1966 Additions

In general, we recommend upgrading the connections between the existing roof framing and the walls for a better lateral resistance to improve life safety and reduce damage to the structure during a seismic event. This could include new blocking between new members that is connected to the existing masonry walls and the existing roof sheathing to improve the in-plane lateral resistance. We also recommend adding a new retrofit strap that is post-installed to the CMU wall and nailed to the wood framing to improve the out-of-plane performance of the wall. If any remodeling is done that exposes all or a portion of the structure, we also recommend inspecting the exposed members for signs of deterioration or failure. If any is present, the members should be replaced or repaired.

The cracking observed at the interface with the 2003 addition should be repaired using an epoxy-based patch system. This area should also be observed for further cracking, which may indicate that the footings in the structure were not properly updated during the 2003 addition for the increased loading.

1978 Addition

In general, we recommend upgrading the connections between the existing roof framing and the walls for a better lateral resistance to improve life safety and reduce damage to the structure during a seismic event. This could include new blocking between new members that is connected to the existing masonry walls and the existing roof sheathing to improve the in-plane lateral resistance. We also recommend adding a new retrofit strap that is post-installed to the CMU wall and nailed to the wood framing to improve the out-of-plane performance of the wall. If any remodeling is done that exposes all or a portion of the structure, we also recommend inspecting the exposed members for signs of deterioration or failure. If any is present, the members should be replaced or repaired.

In addition, if the bleachers at the gym are to remain, destructive investigations should be performed to identify and analyze the structure supporting the bleachers. While the drywall cracking at the tracks may not be due to overstress or failure of the structure, it should be properly verified to ensure the safety of occupants.

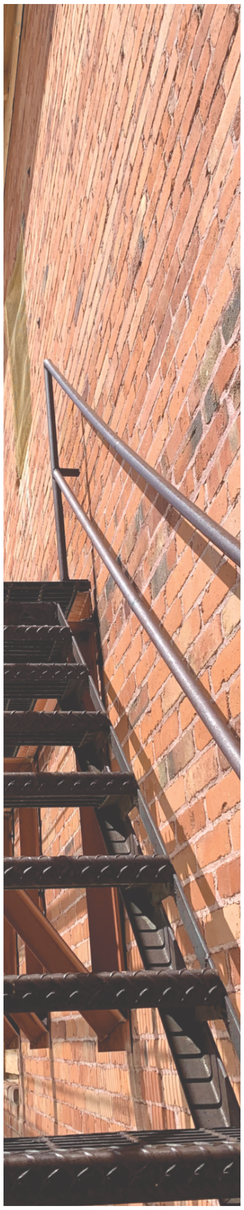
2003 Additions

This area was found to be in good condition based upon our observations. No structural upgrades are required in this area of the building at this time.

Summary and Conclusions

In general, the structure of the Gallatin Gateway School was found to be in good overall condition. There were few areas requiring repair at this time. Unless any remodel effort greatly alters the existing structure, no retrofits to the building are required by code. Upgrades outside of those triggered by the IEBC are considered voluntary and are intended to increase the life-safety of the building and reduce the extents of damage in the event of a design-level seismic event.

The recommended upgrades described above are intended to be incorporated into a larger architectural remodel project. These recommendations can be implemented during other work that is performed in the areas of interest and do not require immediate attention. These can be completed in phases as they correspond to the future plans and use of the building. DCI would be happy to investigate further and expand on these recommendations as they relate to the future remodel work on this building.



Mechanical Assessment

Overview

The mechanical and plumbing systems for the school were assessed by Cushing Terrell so that recommendations could be made for improvement. The assessment consisted of reviewing original construction drawings, the Preliminary Engineering Report and Energy Audit authored by CTA in 2012, onsite assessments, and interviews with end users and the individuals maintaining the systems. Priority was given to those items deemed life-safety issues. Next level priority was given to items that would have the most significant impact on improving the learning environment and occupant satisfaction. The final level of priority are recommendations that would be desirable to implement if funding is available as part of the bonding effort today or can be added in the future as funding allows. The recommendations listed in each sub-heading below are not ranked by importance and can be shifted as deemed necessary by the school district.

Highest Priority:

1. No life-safety issues were observed.

Recommendations for implementation:

1. Update building Direct Digital Controls (DDC) supervisory controller.
2. Improve thermal comfort and ventilation in the classrooms.

Recommended for consideration:

1. Update the entire building to modern Direct Digital Controls.
2. Update the HVAC systems in all the remaining occupied office spaces of the building.
3. Replace the Gymnasium Air Handling units with new units.
4. Replace the cafeteria heating unit with a small air handler to handle ventilation, heating, and cooling.
5. Replace the four existing boilers with new high-efficiency boilers.

Update Building Direct Digital Controls (DDC) Supervisory Controller

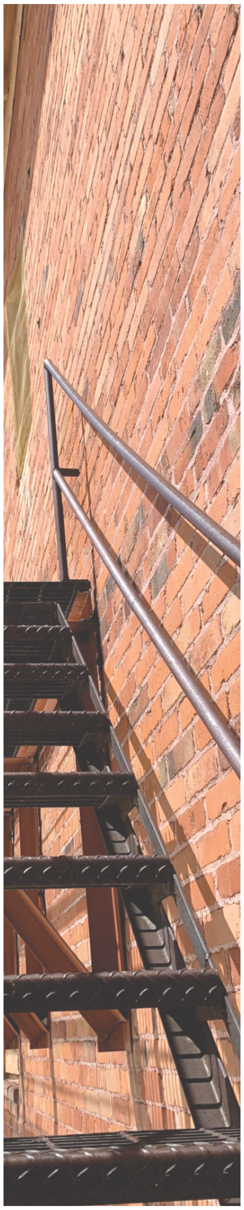
The majority of the unit ventilators in the building have been upgraded from pneumatic or electric controls to a Johnson Metasys digital controls. While this measure was an improvement over the existing controls and served the school well, this equipment is now outdated, has limited functionality, and controllers frequently go offline.

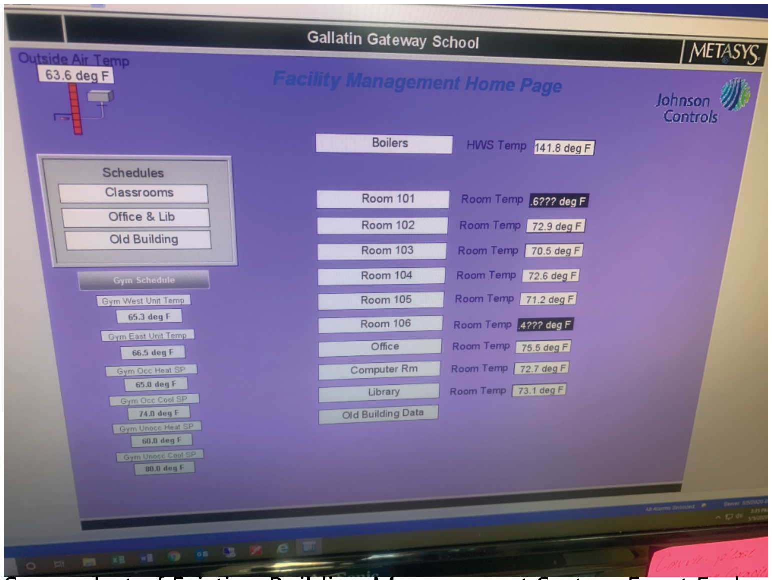
Recommendation:

This recommendation would upgrade the Metasys system to a new open source supervisory controller with backwards compatibility to existing DDC field controllers, and also provide the flexibility for the district moving forward to implement a modern digital controls system. This controller would have better reliability and functionality and be the backbone of future controls improvements.

The new Supervisory Controller would provide the following features:

- Open Source allows the district to use different control contractors to update and maintain the equipment in the future, without being limited to proprietary equipment.
- Supervises communication and data sharing between DDC field controllers.
- Stores graphics and provides a web-browser based user interface.
- Allows users to monitor, adjust, schedule, and override equipment.
- Provides trend data and alarms, sends email and text notifications.





Outside Air Temp 63.6 deg F

HWS Temp 141.8 deg F

Room 101 Room Temp .6??? deg F
Room 102 Room Temp 72.9 deg F
Room 103 Room Temp 70.5 deg F
Room 104 Room Temp 72.6 deg F
Room 105 Room Temp 71.2 deg F
Room 106 Room Temp .4??? deg F
Office Room Temp 75.5 deg F
Computer Rm Room Temp 72.7 deg F
Library Room Temp 73.1 deg F

Gym West Unit Temp 65.3 deg F
Gym East Unit Temp 66.5 deg F
Gym Occ Heat SP 65.0 deg F
Gym Occ Cool SP 74.0 deg F
Gym Unocc Heat SP 60.0 deg F
Gym Unocc Cool SP 80.0 deg F

Screenshot of Existing Building Management System Front End.

Improve Thermal Comfort and Ventilation in the Classrooms

The classrooms are conditioned with heating only unit ventilators. The outdoor ventilation rate is set to a minimum position. None of the classrooms are equipped with cooling. To further complicate the issue, the three North classrooms of the 2001 addition draw ventilation air from the ground level 5′ from the parking lot, often drawing in vehicle exhaust with the fresh air.

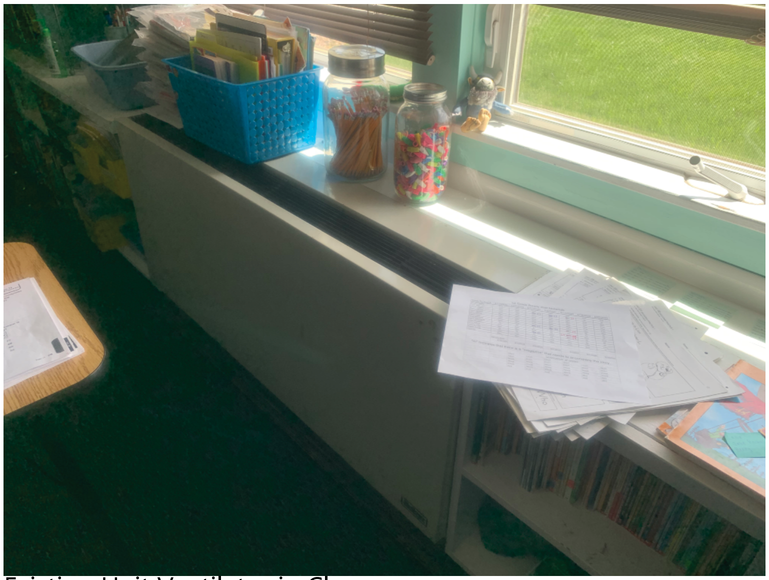
Recommendation:

This recommendation would replace the unit ventilators in all of the classrooms with newer unit ventilators that would be equipped with air-side economization, so that when outdoor conditions are appropriate, free cooling using outdoor air can be utilized. The units could also include mechanical cooling for those operational periods when the outdoor air temperature is too high for free cooling. These new units would have greater control and cooling functionality, which would provide higher occupant satisfaction and improved ventilation to the classrooms.

The three northern classrooms in the 2001 addition would have the outdoor air intakes blocked so they won't be pulling ventilation air from the parking lot and would instead have ventilation air provided by a small heat recovery unit ventilator located on the roof near the bathrooms. This heat recovery unit would pull bathroom exhaust, capture the heat from the exhaust airstream, and pre-heat the ventilation air. It would then fully condition the ventilation air with a hydronic heating coil and introduce the ventilation air directly to these three classrooms at the ceiling level.

The new unit ventilators in the classrooms would provide the following benefits:

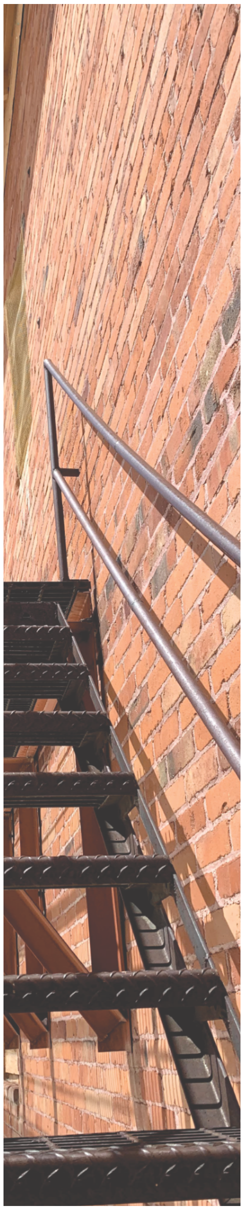
- Improved ventilation to all classroom spaces.
- Economizer cooling for free cooling when outdoor conditions are appropriate and mechanical cooling when required, to improve occupant satisfaction.
- Newer technology incorporates variable speed fans, quieter operation, and lower heating water temperatures.
- Intended to be a low impact HVAC replacement option.



Existing Unit Ventilator in Classroom.

Update the Entire Building to Modern Direct Digital Controls (DDC)

Currently the building has limited digital controls with only the classroom unit ventilators integrated. This provides the district limited functionality and reliability. This equipment is now outdated and due for an upgrade.

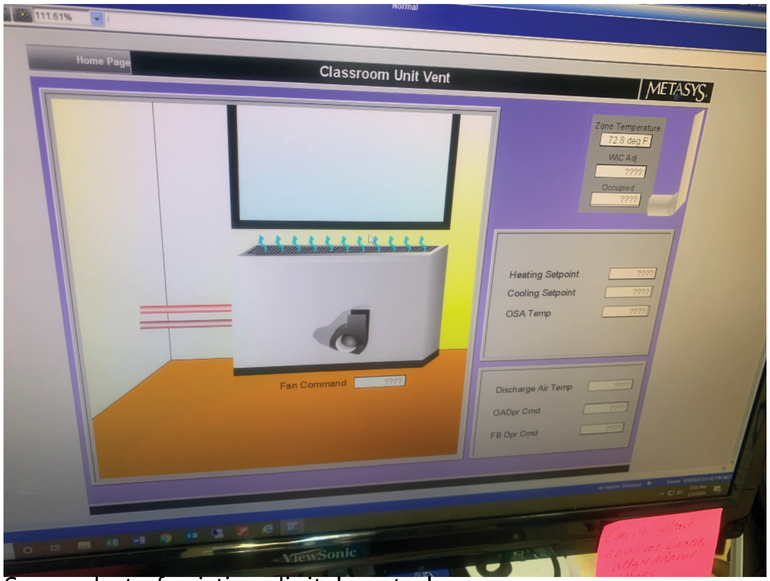


Recommendation:

This recommendation is an expansion of the work done upgrading the DDC supervisory controller. All major mechanical components would be incorporated into the DDC system. This would include pumps and boilers, and could include heating only cabinet unit heaters and fintubes. New thermostats, controllers, valves, actuators, and wiring, if necessary, would be provided. The DDC system would give the administrators greater functionality and control over items such as set-point control and monitoring, trending, alarms, and set-backs. It would also provide the maintenance workers a benefit of seeing in real time what was happening in the system and trend data to help troubleshoot issues. This recommendation can be done at all at once, or piecemeal as funding allows. The greatest value from a first and lifecycle cost would be to complete the work in full, at one time.

The new DDC Building Management System would provide the following features:

- Open Source allows the district to use different control contractors to update and maintain the equipment in the future, without being limited to proprietary equipment.
- Incorporates all HVAC equipment onto the management system.
- Supervises communication and data sharing between all DDC field controllers.
- Stores graphics and provides a web-browser based user interface.
- Allows users to monitor, adjust, schedule, and override equipment.
- Provides trend data and alarms, sends email and text notifications.



Zone Temperature 72.8 deg F
WC Adj ????
Occupied ????
Heating Setpoint ????
Cooling Setpoint ????
OSA Temp ????
Fan Command ????
Discharge Air Temp ????
OADpr Cmd ????
FB Dpr Cmd ????

Screenshot of existing digital controls screen.

Update HVAC Systems in the Remaining Occupied Office Spaces of the Building

The administration area, library, and computer lab are each served by a single cabinet unit ventilator located at the ceiling level. These unit ventilators are all original to construction in 2001. The District Clerk's office has a wall mounted unit ventilator. Currently, the only space in the building with mechanical cooling is the computer lab. The cooling system uses R-22 refrigerant, a refrigerant that has been phased out by the EPA. While it is possible to replace the cooling coil and condensing unit for the cooling system to a newer refrigerant type, on a piece of equipment such as this it is often more cost effective to replace the entire cabinet unit ventilator.

Recommendation:

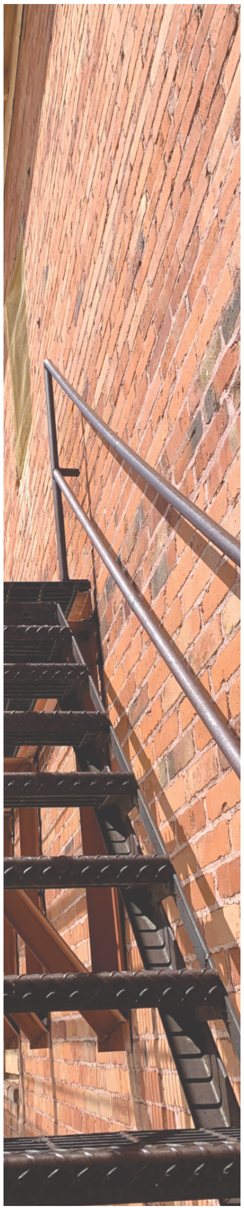
As with the classrooms, it is proposed that newer unit ventilators be installed to serve these spaces. The new unit ventilators would be equipped with air-side economization to utilize free cooling when outdoor air temperatures are appropriate. These units could also be equipped with mechanical cooling to help reduce occupant dissatisfaction when cooling is necessary and outdoor air temperatures are not suitable for free cooling.

The administration area could further be improved by providing a split-system heat pump for the conference room. Currently, several spaces are all controlled by a single thermostat in the Superintendent's office. With the split-system heat pump, the conference room can be heated or cooled independently of the other spaces. Since the District Clerk's office is also utilized as a large conference room, it is recommend that this space also be equipped with a split-system heat pump to improve thermal comfort during varied use.

Existing Unit Ventilator.

This recommendation would provide the following benefits:

- Improved thermal comfort and ventilation to all remaining occupied office spaces in the building.
- Economizer cooling for free cooling when outdoor conditions are appropriate and mechanical cooling when required, to improve occupant satisfaction.
- Newer technology incorporates variable speed fans, quieter operation, and lower heating water temperatures.
- Intended to be a low impact HVAC replacement option.



Replace the Gymnasium Air Handling Units with New Air Handling Units

The two gas-fired gymnasium air handling units are original to the 1979 construction. Care has been taken to maintain the units, including replacement of the motors, upgrading of the controls, and replacement of the actuators for the dampers. However, due to the age of these air handlers, it is recommended they be considered for replacement. They have exceeded their useful life and are likely suffering some level of gas-fired heat exchanger failure which can reduce indoor air quality by introducing products of combustion into the spaces they serve.

Recommendation:

Two new gymnasium units would be provided for the space, installed in the same locations. These units would be equipped with digital controls and demand control ventilation, so they can provide the appropriate amount of ventilation based upon the activity levels in the space. They would also be equipped with air-side economization to take advantage of free cooling as outdoor temperatures allow. These air handlers could be either indirect, natural gas-fired or have hydronic heating coils. Hydronic heating coils would require heating water piping to be extended from the existing mechanical room to the gymnasium.

Existing Cabinet Unit Ventilator Serving Admin Area.

Existing Gymnasium Air Handling Unit.

This recommendation would provide the following benefits:

- Replace end-of-life equipment with new equipment.
- Equipped with DDC for monitoring and administrator control.
- Demand control ventilation reduces energy cost by only providing the appropriate amount of ventilation based upon space utilization.
- Economizer cooling for free cooling when outdoor conditions are appropriate.

Replace the Cafeteria Heating Unit

The cafeteria is served by a single, heating only air handling unit. This space currently has no ventilation or cooling. While currently operational, this unit has exceeded its useful life.

Recommendation:

Similarly to the gymnasium units, it is recommended that a small air handling unit be provided for the cafeteria. This unit would be installed in the same location in the dry storage pantry, or could be roof mounted. This unit would be equipped with digital controls and demand control ventilation. The air handler would also be equipped with air-side economization to take advantage of free cooling as outdoor temperatures permitted. This unit could be either indirect, natural gas-fired or have hydronic heating coils. Hydronic heating coils would require heating water piping to be extended from the existing mechanical room to the gymnasium.

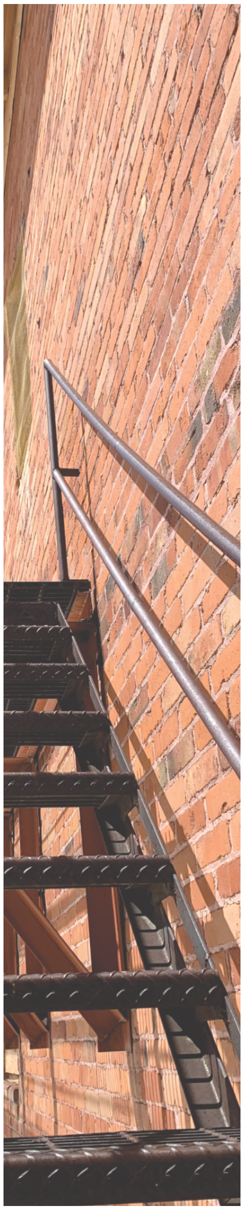
This recommendation would provide the following benefits:

- Replace end-of-life equipment with new equipment.
- Equipped with DDC for monitoring and administrator control.
- Demand control ventilation reduces energy cost by only providing the appropriate amount of ventilation based upon space utilization.
- Economizer cooling for free-cooling when outdoor conditions are appropriate.

Existing Cafeteria Air Handling Unit.

Replace the Existing Boilers with New High-Efficiency Boilers

The school is currently served by two boiler plants, one located in the basement of the original building and one located in the mechanical room of the 2001 addition. All four boilers have been maintained and are functional, but are reaching the end of their useful life. The boilers are all standard efficiency, non-condensing boilers.



Recommendation:

It would be recommended that the school consolidate the two boiler plants into a single plant, served by two new boilers. These new boilers would be high-efficiency, condensing boilers and would serve the entire building. Main heating water distribution piping would be extended to the basement mechanical room, and the existing Burnham boilers would be converted to a back-up boiler plant for redundancy.

This new boiler plant, coupled with upgrades to the HVAC equipment in the building and the inclusion of a DDC system, would reduce energy costs for the district by utilizing higher efficiency fuel conversion, lower water temperatures for heating, and outdoor temperature heating resets.

This recommendation would provide the following benefits:

- Replace end-of-life equipment with new equipment.
- High efficiency, condensing boilers reduce energy cost.
- Equipped with DDC for monitoring and administrator control.
- Consolidated boiler plants into a single boiler room.

Existing Lochinvar Boilers in 2001 Addition Boiler Room.

Existing Burnham Boilers in Basement Boiler Room.

Electrical Assessment

Overview

Electrical/Fire Alarm/IT Infrastructure Upgrade Priorities in order of importance:

1. Upgrade and consolidate fire alarm system under a single manufacturer and location. Add mass notification functionality for campus wide audible messaging capability.
2. Replace non-serviceable/dangerous electrical panels and follow-up with a campus wide Arc Flash Hazard Analysis.
3. Address emergency lighting deficiencies throughout the school campus.
4. Provide separate, secured IT space with dedicated cooling/ventilation.

Lighting and Lighting Control Systems

Lighting and lighting controls throughout the school are mixed between 1914 era incandescent/push-button controls, T8 fluorescent/manual controls, and upgraded LED lighting with limited automatic controls. The LED lighting upgrades in the 1961/1966 era portions of the school are well integrated with the existing infrastructure, and continuation of this lighting upgrade strategy throughout the remainder of the school buildings is the best way forward. Different LED lighting products can be utilized for retrofitting newer fixtures within the 2001/2003 era portions of the school without requiring expensive and complex lighting control upgrades. Where lighting control upgrades (automatic occupancy/dimming controls) are required or desirable, wireless lighting control systems should be used to minimize demolition scope and cost.

Recommendation:

1. General Lighting: The 1914 era portion of the school does not contain adequate lighting in terms of light levels or uniformity, and the lighting controls are no longer serviceable If this portion of the school is to be used for anything more than occasional storage, a complete relighting of the building would be necessary. Surface mounted LED lighting and wireless lighting controls are two options for relighting these spaces, which minimize damage to historic finishes and reduce installed cost.

2001 Hallway Flourescent Lighting.

Gym Lighting with LED retrofit lamps.

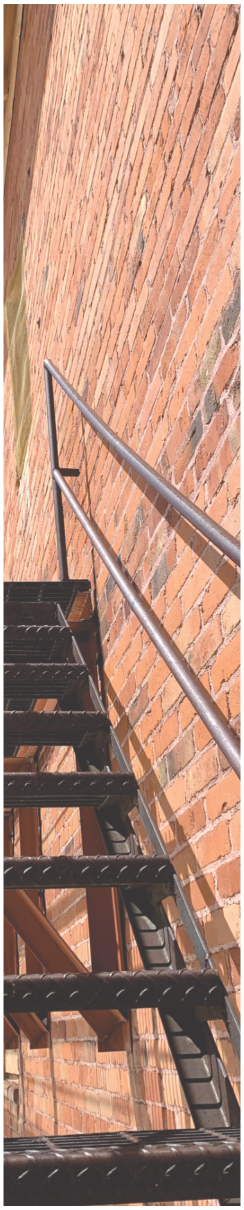
New LED lighting in 1961-1966 era school rooms.

2. Emergency Lighting: The 2001/2003 era portions of the school contain newer LED unit battery fixtures in good/fair condition. In the older portions of the school the emergency lighting is either inadequate or non-existent. A comprehensive emergency lighting assessment for the entire school building is recommended in order to:
   a. Assess the condition of all existing emergency lighting fixtures.
   b. Identify and prioritize specific areas where emergency lighting is deficient.
   c. Propose and design new emergency lighting to comply with code required minimums.

Electrical Power Distribution Systems

The entire school campus is served from a 1200 Amp 240/120V, Single Phase, Three-Wire service. This type and voltage of electrical service is unusual in a school campus that has grown to this size, and will be a limiting factor in any proposed growth or MEP upgrades. Given the current amount of MEP equipment powered at 240V/1PH, it would be extremely expensive to provide a different type of electrical service. Therefore, upgrading the school's electrical service is only recommended in the event of a total or near total renovation of the school campus.

The electrical service equipment itself is relatively new (2001 era) and in fair condition, but much of the downstream electrical infrastructure throughout the school, particularly in the 1914 original schoolhouse, is well past its serviceable life. Panelboards and wiring in portions of the school built between 1914 and the mid-1960s are also of concern for safety reasons. Staff mentioned seeing visible arcing when operating breakers in some of the older "pushmatic" panels located within the 1914 schoolhouse.



1914 Era "Pushmatic" Panelboard.

2001 Service Equipment in Kitchen Storage Room.

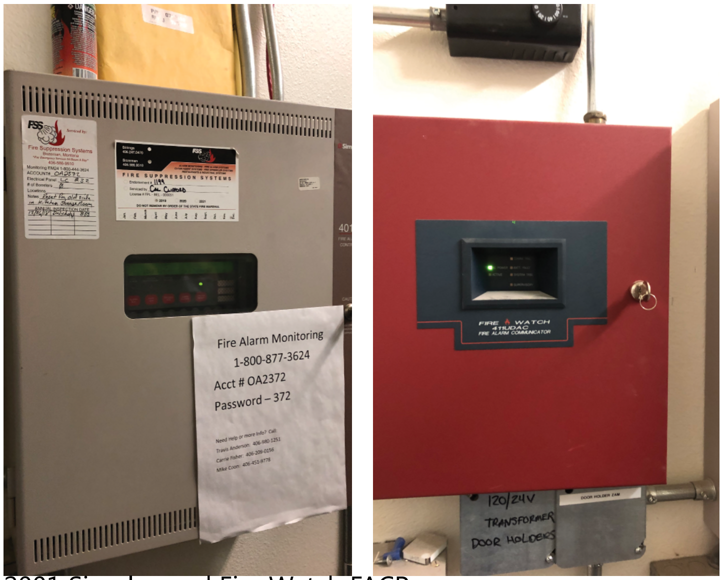
Recommendation:

1. Arc Flash Hazard Labelling: New standards requiring the labelling of panels and electrical equipment have been developing over the last 10-15 years, which require labelling to indicate the level of hazard a particular electrical device poses to the safety of maintenance personnel. Updating this information is important to ensure the safe operation of electrical equipment. Additionally, a full fault current/arc flash hazard study would be vital in identifying other deficiencies that are not immediately apparent from a visual inspection.
2. Panelboard Replacement: Older panelboards with "pushmatic" style breakers should be replaced with modern panelboards with bolt-on, thermal magnetic breakers. These older panels are no longer serviceable and they pose a safety risk to those who operate them.
3. Updated Labelling/Panel Schedules: Permanently affixed breaker labelling at the service equipment (MSB), and updated panel schedules throughout the school would provide a more organized basis for future maintenance and MEP upgrades.

Fire Alarm Systems

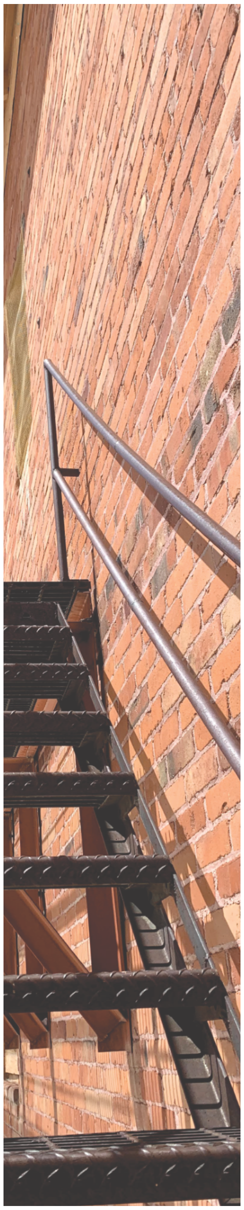
The fire alarm systems throughout the building are a mix of manufacturers (Edwards, Simplex, Fire Watch, etc) and devices that have been cobbled together to keep the fire alarm system operational throughout successive remodels and additions. The fire alarm wiring is also routed open in the hallways and corridors of the 60's era additions.

Based on conversations with staff, it seems there are two separate fire alarm systems. One is the older Edwards system and the other is the Simplex/Hybrid system. This duplication of fire alarm systems is not desirable and should be remedied as soon as possible.



2001 Simplex and Fire Watch FACP.

1960's Edwards FACP.



Recommendation:

1. Replace outdated/complex Fire Alarm System: From a life safety perspective, replacing and consolidating the school's fire alarm system under a single manufacturer and warranty should be the highest priority. Additionally, a new addressable fire alarm system for the entire campus should report from a single location in order to allow first responders to more clearly identify the type of emergency they are facing and react appropriately. Mass notification, an increasingly vital part of school emergency preparedness, would be included in the upgrade of the fire alarm to allow various types of emergency messages to be broadcast throughout the school in order direct staff response to specific emergencies and threats.

Special Systems (IT Infrastructure/CCTV/Clock-Bell-PA)

Most of the IT infrastructure for the school campus is housed in the janitor's closet adjacent to the boiler room located in the 2001 era addition (Temperature adjacent to IT equipment was 92.3F during site visit). Most equipment is stored on kitchen shelf type racks and there is no obvious labelling system in place for UTP cabling.

Recommendation:

1. IT Space Upgrades: The need for a dedicated room for IT equipment is driven by three concerns:
    a. Equipment Protection: IT equipment is extremely sensitive to heat and moisture. The location of the IT equipment in an uncooled space next to a boiler room in an open janitor's closet is a threat to the longevity of the equipment.
    a. Security: The CCTV cameras and all of the cabling serving the school is in an unsecured space. Almost anyone could gain access to the school's security and IT infrastructure.
    a. Ease of Maintenance: Once a large structured cabling system becomes disorganized and mislabeled it can become a monumental task to maintain and extend the system.
2. Cable Routing and Organization: IT cabling, fire alarm cabling, and temperature controls cabling have been routed and fastened open in hallways. While this is primarily an aesthetic issue it also makes maintenance more difficult.

Open, Mixed Cabling Systems.

IT Infrastructure.

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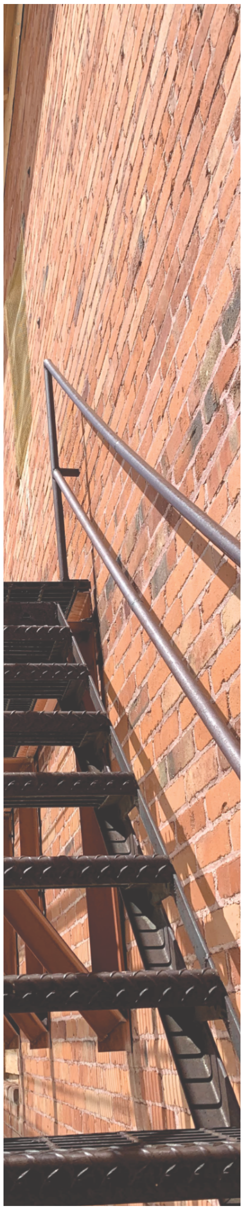
Appendix

A. Building Assessment (1914 Building), Egress Assessment, & Safety Assessment of Gallatin Gateway School - November 2016; prepared by CTA Architects Engineers & BCE Engineers



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Building Assessment

November 2016

Building Assessment (1914 School Building)
Egress Assessment &
Safety Assessment of the

Gallatin Gateway School

Building Assessment

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Gallatin Gateway School District
100 Mill Street
Gallatin Gateway, Montana

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I. Executive Summary

Introduction

Statement of Purpose

CTA Architects Engineers (CTA) and Beaudette Consulting Engineers (BCE) were engaged by the Gallatin Gateway School District in May 2016 to perform a condition assessment of the 1914 original masonry school building. This included a code analysis and structural evaluation. In addition, the team was also requested to evaluate the egress and life safety attributed to the entire building. The intent of this report is to evaluate the current conditions and to identify deficiencies and recommend potential solutions.

Report Organization

In response to the scope of work outlined above we have organized the report into the following sections:

I. Executive Summary
II. Building Code Analysis (1914)
III. Architectural Assessment (1914)
IV. Structural Assessment (1914)
V. Egress Analysis (Entire Building)
VI. Safety Analysis (Entire Building)

Findings

II. 1914 Building Code Analysis

The original 1914 school building is well constructed and has been well maintained. When the building is held up to current code standards (2012 International Building Code and the 2010 Americans with Disabilities Act Standards) the following issues come to light:

- The existing stair is not in a rated enclosure, allowing a fire to spread quickly through the building and limiting egress options for the inhabitants.
- The structure is not designed to current construction standards, including gravity loading and seismic reinforcing.
- All levels of the building are not accessible to the handicapped, thus requiring the installation of an elevator.
- The toilet rooms are outdated and not sized to accommodate the handicapped.
- The current code requires an automatic sprinkler system for the entire building in its current configuration.
- A fire alarm system, including smoke detectors and horn strobes is required under current building codes.

Five options for rehabilitating the 1914 building have been identified:

Option 1: Do nothing. Allow the building to deteriorate and demolish it. Estimated Cost $180,000

Option 2: Provide minimal upgrades to the building, providing a safer building. Estimated Cost $405,000

Option 3: Renovate the 1914 building in its entirety. Estimated Cost $770,000

Option 4: Renovate the 1914 building and provide an automatic sprinkler system and fire alarm system to the entire school. Estimated Cost $1.12M

Option 5: Raze the 1914 building and replace it with a new code-compliant building. Estimated Cost $1.32M

III. 1914 Building Architectural Assessment

The existing 1914 school building is in serviceable condition and has been well maintained over the years. The following items should be addressed:

- Eliminate sewer gas identified in the second floor corridor.
- Update the inspection of the boilers.
- Replace doors and hardware in order to achieve improved fire separations.
- Conduct minor masonry repairs.
- Install safety glazing in all glazed doors.
- Reglaze and paint the windows.
- Weather-strip the windows.

IV. 1914 Building Structural Assessment

BCE conducted an on-site inspection of the structural systems of the 1914 building. A summary of their findings is as follows:

- The structural members of the roof and floors are undersized per today's loading standards.
- The roof and floor systems need to be better tied to the masonry walls to increase resistance to a seismic event.
- The floors and interior side of the walls should be sheathed in plywood to increase resistance to a seismic event.

V. Egress Analysis

CTA conducted an on-site inspection of the egress of the entire school building. A summary of our findings are as follows:

- Most spaces meet current egress requirements for an educational facility.
- The corridor doors throughout the building are required to have a 20 minute fire rating. Except for the 2003 addition, none are rated.
- The egress doors from the gymnasium are undersized per current codes and should be replaced.

VI. Safety Analysis

CTA conducted an on-site inspection of the safety of the entire school building following the Crime Prevention through Environmental Design (CPTED) guidelines. A summary of these findings are as follows:

- The school meets most of the guidelines and principals of CPTED.
- A controlled access point at the school's entry should be established to prevent someone from entering the school without permission or escort.
- The school should have the ability to be secured at a moment's notice.
- Classrooms should have visual access to the corridors to enhance visual surveillance.

II. Code Analysis

Introduction

Intent

Gallatin Gateway School (GGS) is a valuable asset to the community, due to both its inherent architectural character as well as the service it provides.

The School Board's ultimate goal is to assure the safety and standard of care for the students that attend the school and the staff and facility that serve and educate the students. This report is intended primarily to serve the School Board and the Community by providing options and relevant information to prioritize their needs and create the basis for making informed decisions regarding the future of the school.

This report will assess GGS's architectural and structural conditions, evaluating their current status as well as their long-tern feasibility. Life safety, accessibility and building code compliance will be reviewed relative to their impact on decisions moving forward.

The structural findings prepares by Beaudette Consulting Engineers is presented later in this report.

This document includes a review of the building's needs based on recent reports and provides options for renovating, rehabilitating, and eventually fully utilizing the original 1914 school building. The best option for the students and the 1914 building will be based on the results of careful collaboration between the community and the School Board. Combining the needs of serving the community with the long-term feasibility of the structure, it is hoped that the building will continue to serve the community another 100 years.

Referenced Codes and Standards

The following report may reference specific building codes and standards as they relate to this facility. These include, but are not limited to, the following:

- 2012 International Building Code (IBC)
- 2012 Uniform Plumbing Code (UPC)
- State Administrative Rules of Montana (ARM) 24.351

State and local municipalities have adopted the above codes for building code compliance and accessibility standards. The existing building use / occupancy classification is Education – Group E and no change in use / occupancy is anticipated. Should the use / occupancy change, further analysis will be required.

Additional codes and standards that may be referenced include:

- American National Standards Institute, ANSI A117.1 – 2003 Accessible and Usable Buildings and Facilities (ANSI A117.1)
- 2010 Americans with Disabilities Act Standards (ADA)

The following reports have been commissioned and issued to the School Board.

- Preliminary Engineering Report and Energy Audit – May 2012 prepared by CTA Architects Engineers

In addition to the above, the school district has provided all available drawings of various additions to the 1914 original school building.

General Building Description and Alteration History

1914 – The original two-story school was constructed and remains at its original location. The original school building contained four classrooms, four toilet rooms, one office and storage areas. This building was constructed of load-bearing masonry exterior walls and wood-framed floors and roof. Construction Type III-B.

1961 – The first one-story addition was constructed immediately to the south of the original school. This addition included four classrooms, multi-purpose room, and restrooms. Construction Type III-B.

1966 – The second one-story addition was constructed immediately west of the original school and the 1961 addition. This addition contained four classrooms. Construction Type V-B.

1978 – The third one-story addition was constructed immediately to the east of the 1961 addition. This addition contained a gymnasium, locker rooms and two classrooms, the easternmost is presently the music room. Construction Type III-B.

2003 – The fourth and most recent one-story addition was constructed immediately to the west of the 1966 addition. This addition contains the school entry, administrative offices, library and computer/technology lab, toilet rooms, and six classrooms. Additional toilet rooms were also added to the south of the 1978 locker rooms. Construction Type V-B.

Basic Architectural Code Assessment - 1914 Original School Building

The architectural portion of this assessment will focus on general issues with construction type, egress, and handicapped accessibility.

2012 International Building Code

305.1 - Use/Occupancy Educational Group E

311.1 - Storage Group S

- Moderate Hazzard Storage Group S-1
    - Books, Boots & Shoes, Cardboard Boxes, Furniture, Clothing
- Low-hazard Storage Group S-2
    - Metal desks with plastic tops and trim

503.1 - Construction Type for Use Group E

- Construction Type III-B
- Roof is constructed of combustible materials
- Exterior masonry walls are fire resistive
- Exterior walls are load-bearing, windows and openings are not protected.
- Construction Type III-B permits maximum 2 stories, 14,500 square feet per floor.
- The basement may be considered a story due to the height of the adjacent grade (ground) and the location of the first floor level.

506.2 - Frontage Increase

- 196 Linear feet of perimeter frontage – permits 30% area increase

506.1 - Area Increase

- Area may be increased with the installation of an Automatic Sprinkler System
- Combined allowable area plus area increase allows 18,850 square feet

508.4 – Required Separation of Occupancies

- Occupancies E & S-1 non-sprinkled – 2 Hour separation
- Occupancies E & S-1 sprinkled – 1 Hour separation
- Occupancies E & S-2 non-sprinkled – 1 Hour separation
- Occupancies E & S-2 sprinkled – 0 Hour
- Occupancies S-1 & S-2 non-sprinkled – 0 Hour separation

- Occupancies S-1 & S-2 sprinkled – 0 Hour separation

The building code requires the separation of different occupancies E - Educational occupancies need to be separated from S - Storage occupancies.

During our site investigation we have identified both types S-1 and S-2 storage. The required separation between an E and S-1 occupancy is a 2 hour fire rating for a non-sprinkled building; this is reduced to a 1 hour fire rating for a sprinkled building.

The required separation between an E and S-1 occupancy is a 0 hour fire rating for a non-sprinkled building, this is reduced to no fire rating for a sprinkled building.

The School Board will need to either relocate the items off-site or secure them in a newly created space(s) with the proper fire separation.

509 - Incidental Use

- Incidental uses cannot exceed 10% of the total building.

601 - Required Fire Ratings

- All systems for Construction Type III-B are non-rated, except for exterior load bearing walls – 2 Hour rating

716.5 - Corridor Door Rating

- 20 minute rating required
- Existing doors in the original building and all additions except for the 2003 addition are not rated and thus do not comply.

803.9 - Corridor Finishes

- Corridor finishes require a minimum Class of finish materials for non-sprinkled buildings –
- Interior exit stairways and passageways - Class A
- Corridors and enclosure for exit access stairways – Class B
- Rooms and enclosed spaces – Class C
- The classification of the existing carpeting on the floor cannot be conclusively confirmed.

903.2.3 - Automatic Fire Sprinklers

- Group E (Educational Occupancy) states that Fire Areas greater than 12,000 square feet are required to be protected by an automatic sprinkler system. A Fire Area includes the area of the building bound by fire barriers including horizontal projections of roof(s) above. The existing school is currently divided into three distinct Fire Areas:
    - The 2003 building addition (exceeds threshold)
    - The combined 1914, 1961, and the 1966 original building and additions
    - The 1978 building addition.
    - The *Fire Areas* of the 2003 building addition and the combined 1914, 1961 and the 1966 building areas exceed the 12,000 allowable square foot minimum requirements, thus requiring the installation of an automatic sprinkler system.
- There are several benefits to installing sprinklers in the building, they:
    - Provides a safer environment to the inhabitants,
    - Allow for a more flexible solutions to expanding and/or modifying the existing building(s),
    - May reduce building insurance premiums.

907.2.3 - Fire Alarm System

- Manual fire alarm systems are required in Group B unless the interior corridors are protected by smoke detectors, or the building is protected by an automatic sprinkler system. (Not applicable)

1005.1 - Stair Minimum Widths
- .3 inches per occupant – stairways
- .2 inches per occupant – all other locations

1007.3 - Accessible Stairways
- Minimum width required 48 inches - The existing stair does not comply.
- Stairs require an Area of Refuge, separated by a smoke barrier. None provided.

1008.1.9 - Doors Operations
- Doors to have level handle hardware. Most doors are non-compliant.

1008.1.10 - Panic and Fire Exit Hardware
- Rooms with occupant loads of 50 or more require panic hardware. Complies.

1009.2 - Interior Exit Stairways
- Interior exit stairways shall lead directly to the exterior or be extended through the building with an exit passageway.

1009.7.2 - Risers Height and Tread Width
- Riser heights shall not exceed 7 inches
- Tread widths shall not be less than 11 inches

1009.7.4 - Stair Dimensional Uniformity
- Treads and risers shall be uniform in size and shape. Tolerance shall not exceed 3/8 inch. The riser height does not comply.

1009.10 - Vertical Rise
- A flight of stairs shall not exceed 12 feet between floor levels.

1012.2 - Handrails Heights
- Handrails shall be mounted 34-38 inches above the leading edge of a tread. The existing handrails do not comply.

The handrails from the main floor landing to the first floor of the 1914 building are mounted too high for use by children and too low for use by adults. The handrails currently do not return to the walls or have proper extensions.

1012.6 - Handrails Extensions
- Handrails shall return to the wall and have extension at the top and bottom of each run. The existing handrails do not comply.

1014.3 -Common Path of Egress Travel
- Common path of egress shall not exceed 75 feet - Complies

1015.1 - Spaces with One Exit
- Spaces with 50 or more occupants require two exits - Complies

1015.2.1- Exit Separation
- Two exits must be a minimum of ½ the diagonal distance apart. - Complies

1016.1 - Exit Access Travel
- Exit travel distance shall not exceed 200 feet - Complies

1018.1 - Corridor Fire Rating
- Corridor fire rating for an E occupancy non-sprinkled building is 1 hour - Complies

1018.2 - Minimum Corridor Width
- Group E occupancies with a capacity of 100 or more require 72 inch wide corridor - Complies

1022.2 - Stories with One Exit
- E occupancy is not permitted to have one exit. The east classroom on the second floor has only one exit. Does not comply.

1022.2 - Interior Stairways and Ramps

- Stairway enclosures shall have a fire resistance rating of 1 hour in buildings less than four stories.
- Elevators shall not open into stairways.

2406.4 - Safety Glazing - Hazardous Locations

- Non-safety glazing in doors shall be considered as hazardous. The second-story classroom doors and the east entry doors do not contain safety glazing. Does not comply.

3406.1.2 - Existing Fire Escapes

- Existing fire escapes in existing buildings are permitted. Complies

3406.1.3 - New Fire Escapes

- New fire escapes in existing buildings are permitted where exterior stairs cannot be utilized.

Montana Code Annotated 24.301.351

- Plumbing Fixture Counts

- Plumbing fixtures required:
  - 1 toilet per 100 males, and 1 lavatory per 200 males
  - 1 toilet per 35 females, and 1 lavatory per 70 females
- Required plumbing fixtures:
  - 4 male toilets and 2 lavatories
  - 9 female toilets and 5 lavatories
- Provided plumbing fixtures:
  - 8 male toilets and 6 lavatories
  - 11 male toilets and 6 lavatories
- The office and kindergarten through 3rd grade classrooms (1966 addition) were not included in the fixture counts because they have fixtures dedicated to that space. The gymnasium is also not included as it does not add to the occupant load when the school is in session.

Chapter 34 Existing Building Code Review

As tabulated per IBC Section 3412.6. This section provides a tool to assess the level of code compliance of an existing building and ascertain avenues to gain compliance. The buildings scores are compared against established benchmarks.

Section	**Description**	**Equation/Support**	Fire Safety **FS Score**		Means of Egress **ME Score**		General Safety **GS Score**
3412.6.1	Building Height	(55-36.3)/12.5x1	1.28		1.28		1.28
3412.6.2	Building Area	18850/1200*(1-1977/1450)	13.57		13.57		13.57
3412.6.3	Compartmentation	No doors with closers	15		15		15
3412.6.4	Tenant Separations	No doors with closers	-4		-4		-4
3142.6.5	Corridor Walls	No doors with closers	-5		-5		-5
3412.6.6	Vertical Openings	Unprotected opening	-7		-7		-7
3412.6.7	HVAC Systems	Central boiler	5		5		5
3142.6.8	Auto. Fire Detection	Not fully protected	-4		-4		-4
3412.6.9	Fire Alarm Systems	Manual Fire Alarm	5		5		5
3412.6.10	Smoke Control	None	-		0		0
3142.6.11	Means of Egress	Use of fire escape	-		-10		-10
3412.6.12	Dead Ends	No dead ends	-		2		2
3412.6.13	Exit Travel Distance	20x(200-94/200)	-		10.6		10.6
3142.6.14	Elevator Control	No elevator	-2		-2		-2
3412.6.15	Egress Lighting	Complies	0		0		0
3412.6.16	Mixed Occupancies	No mixed occupancies	0		-		0
3142.6.17	Automatic Sprinklers	Sprinklers required none provided	-12		-6		-12
3412.6.18	Stand Pipes	None req'd/provided	0		0		0
3412.6.19	Incidental uses	None	0		0		0

Total Building Score	**5.85**	**14.45**	**8.45**
Required Safety Benchmarks	29	40	40
Exceeds Requirements by	-23.15	-25.55	-31.55

Conclusion – Code

The existing building generally meets many of the current code standards, requirements and dimensions. The following modifications to the existing building will most likely bring the building into compliance. They include:

- Replace the interior exit – provide a rated stair tower with compliant stairs, railings and an area of refuge on each floor.
- Replace corridor doors –replace the non-rated doors with 20-minute doors with closers and smoke seals.
- Install an automatic sprinkler system
- Rework the fire escape – modify the fire escape to provide a second means of egress from the east classroom on the second floor
- Install a smoke detection system and updated fire alarm – verify the capabilities of the fire alarm located in the 2003 addition to see if it can accommodate the additional devises needed in the remainder of the building. This would include smoke detectors, horn strobes, and manual pull stations.

The recommendations itemized above are primarily related to life safety systems and fire/smoke containment. The implementation of the recommendations will greatly impact all of the calculations associated with the building.

Building Envelope

Enhancing the existing exterior envelope by furring out the walls, adding cavity insulation, reglazing the windows, and adding weather-stripping will reduce energy costs and increase user comfort.

American with Disabilities Act Standards

The following areas do not comply:

- Vertical Circulation – there is no elevator access to the first or second floors of the 1914 building.
- Restroom Accessibility – the toilet rooms do not provide adequate space to permit assess to plumbing fixtures. Accessible water fountains do not exist in the 1914 building. Chapter 6 should be followed when designing replacement facilities.
- Area of Refuge – there is no Area of Refuge at the first or second floors of the 1914 building.
- Door hardware – the door hardware at several doors does not include levers.

Other Discipline Assessments

- Structural assessment is provided elsewhere in this document.
- Mechanical assessment was prepared and delivered under a separate assessment.
- Plumbing assessment was not included in the scope of work.
- Electrical Assessment was not included in the scope of work.

Recommendations

There is significant value in the original 1914 school building including: cultural, historical, and built functional space. There is a need to remain fiscally responsible and to maintain efficiency with public funding entrusted to the School District and the Board. We have identified the following potential summary of options regarding the rehabilitation of the original Gallatin Gateway School building.

Option 1:
Do nothing. If the building is not improved or regular maintained it will eventually become uninhabitable resulting in the eventual razing of the structure.

Option 2:
Upgrade the original 1914 school building's selected building systems. Repairing limited seismic elements, provide a stair tower, rated corridors, area of refuge and automatic fire protection, smoke detection, and alarm systems to this building only.

Option3:
Renovate the original 1914 school building completely rectifying the building code, structural, accessibility and life safety deficiencies.

Option 4:
Upgrade the entire school with automatic fire protection, smoke detection, and alarm systems. Provide Building Code and Accessibility upgrades to the original 1914 school building.

Option 5:
Replace the original 1914 school building with a new structure. Raze the existing structure and replace it with a new structure that replaces the program spaces one for one. Either at the site of the original structure or elsewhere on the property.

Detailed Description of Options

Option 1:
If the building is not maintained and no renovation projects are planned for the original 1914 school building, it will eventually become uninhabitable. Once this occurs, the structure would need to be razed in order to not cause harm to the adjacent structures and their inhabitants. Loss of functional space would occur. The cost identified below includes only demolition of the existing building and minor repairs where it adjoins the remaining school.

Estimated Cost - $180,000

Option 2:
Upgrade the basic building elements the original 1914 school building related to life safety, initial structural improvements, and building code deficiencies. This would include the following items:

- Replace the existing stair
- Provide rated corridors
- Rework the fire escape
- Replace the fire alarm and smoke detection system
- Provide limited seismic upgrades including reinforced connections between the roof and floors to the walls.

Estimated Cost - $405,000

Option 3:

Fully renovate the original 1914 school building including all life safety, structural improvements, and building code deficiencies. This would include the following items:

- Replace the existing stair
- Install an elevator
- Provide rated corridors
- Replace the fire alarm and smoke detection system

- Rework the fire escape
- Provide seismic upgrades
- Provide an automatic sprinkler system
- Replace and conceal electrical systems
- Renovate the existing windows
- Insulate the exterior walls

Estimated Cost - $790,000

Option 4:
Fully renovate the original 1914 school building including all life safety, structural improvements, and building code deficiencies. (Identified in Option 3 above.) Install an automatic sprinkler system and related fire alarm and smoke detection systems throughout the entire school. This would include the following items:

- Replace the existing stair
- Provide rated corridors
- Replace the fire alarm and smoke detection system throughout
- Rework the fire escape
- Provide seismic upgrades
- Provide an automatic sprinkler system throughout
- Replace and conceal electrical systems
- Renovate the existing windows
- Insulate the exterior walls

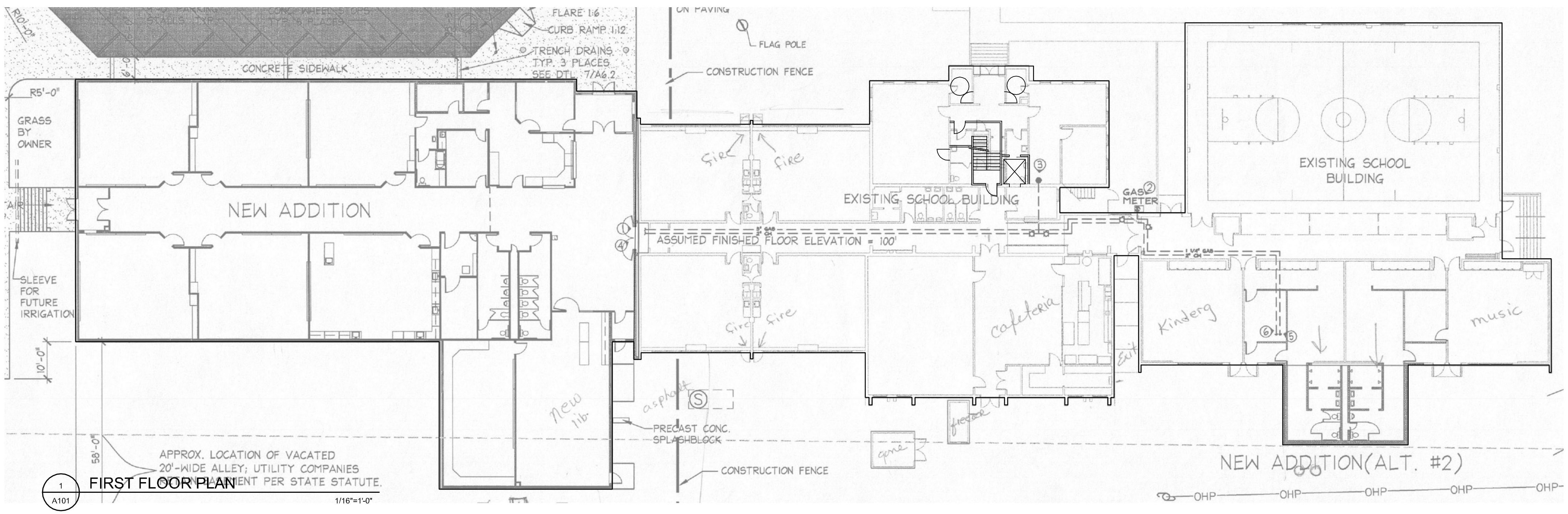
Estimated Cost - $1.12M

Option 5:
Raze the existing Original 1914 School building and replace it with a new fully code compliant facility containing the same programmatic spaces.

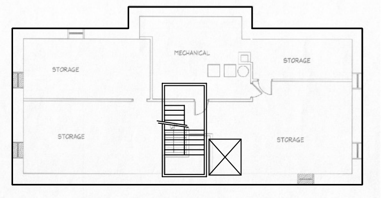
Estimated Cost - $1.32M

General Notes:

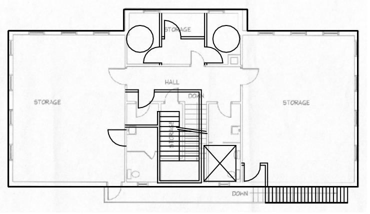
The above estimates costs provided are in 2016 dollars. They do not include the testing for and removal of hazardous materials.



1 A101 FIRST FLOOR PLAN 1/16"=1'-0"



2 A101 BASEMENT FLOOR PLAN 1/16"=1'-0"



3 A101 SECOND FLOOR PLAN 1/16"=1'-0"

CTA

GALLATIN GATEWAY SCHOOL

GALLATIN GATEWAY, MONTANA

NOT FOR CONSTRUCTION - PRELIMINARY DESIGN

Proposed
Plans

06.20.16
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REVISIONS
-

PLANS

A102

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III. Building Assessment

Introduction

Statement of Purpose

CTA Architects Engineers (CTA) was engaged by the Gallatin Gateway School District in May 2016 to perform a condition assessment of the 1914 original masonry school building. The intent of this report is to evaluate the current condition of the exterior envelope and interior materials, and to identify causes of deterioration and recommend repairs; and to provide construction cost estimates for the identified treatments.

General Condition Statement

The original 1914 school building is well constructed and has been well maintained. When the building is held up to current standards (2012 International Building Code and the 2010 Americans with Disabilities Act Standards) the following things come to light:

Note: The actual required improvements will vary depending on the scope and cost of alterations being made at that time.

Items of Immediate Concern

- The boiler inspection certificate was near its expiration. We understand that the inspector had been notified for the reinspection.

- Sewer gas was present in the second floor corridor. It is assumed that the traps of the water fountain, toilets, and lavatories have dried out and were allowing sewer gas to enter the second floor. We recommend that water, then a small amount of vegetable oil, be poured in each trap. The vegetable oil will slow down the evaporation of the water in the trap.

Entire School Complex of Buildings

- Due to the size of fire areas of the building the installation of an automatic sprinkler system is required. (Fire areas may be modified in such a manner as to not require an automatic Sprinkler system. Further in-depth study is required). See the Code Analysis portion of this report for additional information.

- A new fire alarm system that would include audio and visual annunciators is required. The existing fire alarm system in the 2001 addition may be compliant. Further in-depth analysis is required. See the Code Analysis portion of this report for additional information.

1914 Original School Building

- Any renovation of the 1914 School Building would require redesign of the toilet rooms to aprovide handicapped accessibility.

- The current use of the second floor as storage requires fire separation and the construction of fire rated systems including walls, floors and doors. It is recommended that the storage be removed from the building.

- The existing fire escape can be used as a second means of egress. The door and hardware at the base of the fire escape are required to be modified to meet current building codes.

- In order to make the 1914 building fully accessible an elevator will need to be installed. This may not be required depending on the scope of the proposed alterations and the programmatic overlap with the other additions.

- The existing fire escape could be modified to accommodate a second means of egress from the east second floor classroom.

- The existing door hardware (knobs) will need to be replaced with level handles.

- The non-rated safety glazing in all doors will need to be replaced with safety glazing.

- The run of stairs from the first floor to the main level of the building additions has risers of varying height. This run of stairs should be replaced. As part of a major renovation the stair should be replaced from the basement to the second floor.

- Minor masonry repairs are needed. Efflorescence is visible on the north elevation of the building; it should be brushed off. Mortar patching will be necessary at the east basement windows. The brick sills need to be repointed.

- The windows are in need of reglazing and repainting. The installation of the weather-stripping is recommended.

- The accumulation of debris in the east egress stair from the gymnasium needs to be monitored to prevent the floor drains from becoming plugged and water entering the building.

- See the structural analysis of this report for additional information.

Construction Cost Estimate

A cost estimate for assessment related repairs is provided at the end of this section.

Purpose & Methodology

CTA Architects Engineers (CTA) and Beaudette Consulting Engineers (BCE) visited the site June 14, 2016 and conducted visual assessments of the foundations, exterior walls, doors, windows, and roof. Interior floors, walls, ceilings and doors were also assessed. BCE examined the structure, where visible, and looked for apparent structural deficiencies. The CTA / BCEs assessment team was comprised of Project Manager Bob Franzen, AIA, Sky Cook Project Architect and Samantha Fox, Structural Engineer. Our efforts were aided by assistance from the staff.

Hazardous Materials

Hazardous materials are typically found in construction of this time period. Until testing is performed, it should be assumed that lead-based paint and various asbestos-containing material are present. Asbestos is often in window glazing putty and insulation. Asbestos is also found in plaster and mortar, albeit less frequently.

Project Information

Building Name –

Gallatin Gateway School 1914 Building

Building Owners –

This building is owned by the Gallatin Gateway School District.

Building Use – Current & Historic

This building is currently used as a public school for the Gallatin Gateway School District. The original 1914 school building initially used as classrooms is now used as an art instructional space, office/Board meeting room, and storage.

Location

This school building is located in Gallatin Gateway Montana, Montana, in Gallatin County.

Construction Date

1914

Building Area

5,911 square feet

Building Orientation

This rectangular building is oriented east/west and is squarely aligned with the street.

Previous Interventions/ Documentation/Assessments

Preliminary Engineering Report and Energy Audit – May 7, 2012 prepared by CTA Architects Engineers.

Current Floor Plans

The floor plans of the Gallatin Gateway School have been provided by the GGSD from the previous remodeling and building addition projects, the most current prepared by JGA Architects in 2003.

Condition Assessment

This building consists of the originally constructed 2-story school and 3 subsequent additions. Only the 1914 original classroom building is included in this assessment.

Exterior Assessment

Foundation

Description

The foundation of the 1914 portion of the building is constructed of board formed cast-in-place concrete. The former window openings in the basement have been infilled with concrete block.

Condition

The concrete foundation walls are in good condition. The inside corner of the east wall of the porch and the east end of the north wall of the building have efflorescence (salts being driven from the interior of the concrete to the exterior by following moisture.) This isolated condition may be the result of irrigation water hitting this portion of the building or an overflowing gutter above.

Foundation- Northeast corner of porch.

Foundation – North wall east end.

Recommendations

Examine the irrigation system to determine if one of the sprinkler heads is spraying the building. If so, adjust the head to avoid hitting the building. Verify that the existing gutter and downspouts for this area of the building are clear of debris and free flowing. If they are blocked, remove the debris. Remove the white salt stains from the concrete by brushing them with a stiff natural bristle brush.

Exterior Walls

Description

The exterior walls of the 1914 building are constructed of solid masonry (red brick), approximately 12” in thickness.

Condition

In general the existing masonry walls are performing well and exhibiting minimal wear. The mortar between the brick at the window sills has eroded over time. The northeast corner of the masonry wall has efflorescence (salts being driven from the interior of the wall to the exterior by following moisture.) There are minor cracks in the masonry between the basement and the first floor windows at the west end of the north elevation. There are minor holes in the masonry at the east elevation south basement window.

Masonry Wall – East elevation.

Recommendations

Remove loose and/or deteriorated mortar at each window sill. Replace with new lime-based mortar. Protect the skyward joints with sealant capped with lead caming. Verify that the existing gutter and downspouts at the northeast corner of the building are clear of debris and free flowing. If they are blocked remove the debris. Verify that all joints in the gutter and downspouts are tight and not leaking water. Then remove white salt stains from the masonry by brushing them with a stiff natural bristle brush. Visually monitor the cracks in the masonry and report any changes to BCE. Remove any loose mortar from the masonry at the east elevation south basement window. Point the joints with lime-based mortar.

Windows

Description

The typical windows in each classroom are single-glazed wood double-hung windows with a one-over-one lite pattern. The window at the landing is a slightly smaller version of the typical classroom window. The washroom windows have been replaced with casement windows.

Condition

The condition of all of the windows is generally good. The exterior paint has begun to peel and is now ready to be prepared and painted. The glazing putty is loose and or cracked at most sash. There does not appear to be any weather-stripping. The sealant in the joint between the window jambs and the masonry has dried out and cracked. The casement window in the first floor Men's Toilet Room is missing hardware and has been sealed shut with sealant.

Window - Sill

Recommendations

Replace loose and/or missing glazing putty. Paint the exterior of all windows with a high-quality paint system. Install bronze or zinc weather-stripping at each window. Remove the deteriorated sealant between the window jambs and the masonry and install new high quality non-staining urethane sealant.

Exterior Doors

Description

The exterior doors at the north entry are wood with one-half lites. They are currently used for emergency egress only. There is a single-leaf flush panel wood which leading from the west classroom on the second floor to the fire escape.

Condition

The east entry doors and hardware are in good operating condition. The glass lites in the doors do not contain a certification that they are tempered safety glass. Safety glazing is required in doors per IBC 2406.1. The weather-stripping has worn and is due for replacement. Confirm that the door closers comply with the ADA delayed closing timing. The south egress door from the west classroom on the second floor to the fire escape is beyond its useful life span.

Recommendations

Replace the glass in the doors with safety glass. Replace the weather-stripping. Confirm that the door closers comply with the ADA 404.2.8 closing timing requirements. Replace the south egress door to the fire escape with a new insulated hollow metal door.

Roof

Description

The 1914 building has a wood framed hip roof with asphalt shingles and aluminum gutters and downspouts. A galvanized ventilator exists on the north face of the roof. A wood constructed tower is located above the entry on the north face of the roof. The tower has a gable roof with a ridge that runs north-south. The walls of the tower have wooden louvers on all four sides. Wood shingles cover the remainder of the sides of the tower.

Condition

The asphalt shingles, gutter, and downspouts appear in good condition with several years of life remaining. The ventilator appears to be in serviceable condition. The wooden tower also appears to be in good condition.

Roof – South facing slope.

Ventilator

Recommendations

Examine the roof and gutters on an annual basis, ensuring the gutters and downspouts are clear of debris. Perform minor maintenance as identified with each inspection. Prepare and paint the wood trim on the tower at regular intervals.

Site Conditions

Description

The overall site slopes from the northeast to the southwest. The gymnasium is set into the hillside to the east. The gymnasium and the 1914 school building roofs drain to grade at the north side of the building.

Condition

There appears to be a depressed area north of the 1914 building entry that may retain storm water. The east gymnasium egress doors have debris at the landing which could block the floor drain.

Egress Doors - East Gymnasium

Recommendations

Monitor the east gymnasium exit and the surface run off at the area north of the 1914 building. Clear debris and maintain the floor drains at the bottom to the stairs to the east gymnasium exit on a regular basis.

Interior Assessment

Floors

Description

The floors are covered with carpeting in all areas except the four toilet rooms and storage rooms which have sheet vinyl flooring. All areas have a vinyl or rubber base applied to the original 12" tall painted wood base.

Condition

The flooring in the classrooms and hallway is nearing the end of its useful life and will need to be replaced within 5-7 years. The present art room flooring is heavily stained. The carpet in the stairway from the ground floor of the adjacent school building to the second floor is worn and should be replaced within 3-5 years. The base is presently in serviceable condition.

Floors – Art Room

Recommendations

Replace the worn carpeting within the next 5-7 years. If the art room is to remain an as an art teaching space, then the carpet should be replaced with vinyl tile. If the art room is to be re-purposed into a classroom the carpet should be replaced with new carpeting. Review the condition of the base at the time the carpet is being replaced, and replace if necessary.

Interior Walls

Description

The walls throughout the building are painted plaster or gypsum board with the exception of the toilet room walls which are finished with vinyl covered Masonite. The second floor central storage room is finished with wood paneling.

Condition

In general the plaster or gypsum board walls are in good condition. The following areas require patching:

The west wall of the art room above the sink is severely stained.

Interior Walls - Art Room west wall.

Recommendations

Patch holes identified above, prime and paint. Apply a water resistant material (such as FRP or stainless steel sheet) above the sink in the art room.

Ceilings

Description

The ceilings in all classrooms are 2x4 lay-in acoustical tile in an exposed metal grid. The toilet rooms, storage rooms and stairway ceilings are all constructed of painted plaster or gypsum board.

Condition

The 2x4 lay-in ceilings are all in good condition. The plaster or gypsum board ceilings in the small storage rooms have holes in them.

Ceilings – Storage room patch.

Recommendations

Patch repair the holes in the small storage room ceilings and prepare and paint the ceilings.

Interior Doors

Description

The first floor classroom doors and the toilet room doors are flush wood doors with a clear finish. The second floor classroom doors are ½ lite, painted, wood doors The storage room doors are painted raised panel doors.

Condition

The glass lites in the second floor doors are not safety glass. The door hardware on the second floor classroom doors is not functioning.

Recommendations

Remove the glass lites in the second floor classroom doors and replace with safety glass. Remove and replace the second floor classroom door hardware.

Toilet Rooms

Description

There are two toilet rooms for each floor of the building, one Men's, and one Women's. The difference between the two is that the Men's includes a trough urinal.

Toilet Rooms – 1st Floor Women's Room

Condition

The toilet rooms are in generally good condition, however the toilet rooms are undersized and not compliant with accessibility standards.

Recommendations

The toilet rooms should be demolished as part of a building renovation and designed to meet current codes and accessibility standards.

Stairs

Description

The 1914 building has two floors above grade and a basement. The existing wood stair connects the basement, first and second floors. The stair is constructed of wood and is covered in carpet. There are wood handrails on both sides of the stair. The 1914 building connects to the 1961 addition and the remainder of the school at a mid-landing between the basement and the first floor.

The stair is divided into three sections: basement to the mid-landing; mid-landing to first floor; and first floor to second floor. Wood doors separate these levels. None of the doors are fire rated.

The bottom riser between the mid-landing and the first floor is considerably shorter than the remaining risers.

Stair – Mid-landing to First Floor

Condition

The run of stairs from the mid-level landing are a tripping hazard. IBC Section 1009.7.4 requires egress stairs to be dimensionally uniform. The stairs are not in a rated enclosure as required by IBC Section 1022.1.

The handrails are mounted below the required mounting heights and do not return to the wall.

Recommendations

The full run of stairs from the basement to the second floor should be replaced as part of a remodeling project.

Fire Escape

Description

The second floor west classroom second exit is an existing fire escape. Fire escapes are permitted under Chapter 34 (dedicated to existing buildings) of the International Building Code. The fire escape extends horizontally east across the south elevation of the building then down to grade. The bottom riser(s) are encased in the concrete landing and thus the handrails terminate in the landing as well. A metal fence and gate provides security at the bottom of the fire escape. The hardware on the gate is a gate latch. The size of the gate is approximately 3’ x 5’.

Fire Escape – Landing

Fire Escape –Looking East

Condition

The fire escape appears to be in serviceable condition and compliant with Chapter 34 of the IBC. The gate in the fence at the bottom of the stair does not meet code-required head clearance of 6’-8”. The latching door hardware does not meet IBC Section 1008.1.1 requiring doors to have panic hardware for occupant loads over 50.

Fire Escape – Security Gate Looking West

Fire Escape – Gate Bolt

Recommendations

Reconstruct the fence and gate to accommodate a 3’-0” wide x 6’-8” tall gate. Replace the gate hardware with panic hardware.

Miscellaneous

Description

Exposed electrical splices were found above the ceiling adjacent to the attic access in the second floor center storage room.

Condition

Exposed electrical splices are not permitted by the building codes.

Recommendations

Conceal all electrical splices with in approved junction boxes.

Miscellaneous – Exposed Electrical Wiring

Disclaimer

This report reflects observations on the dates of the inspection. The inspection was based on those building components accessible to view; some material probes and selective removal supplemented the visible evidence where necessary. CTA makes no representations regarding latent or concealed defects that may exist in the building. This report is made only in the best exercise of our ability and judgement. Not all locations of all materials are described herein, yet all areas of concern are addressed.

Illustrations

All photographs included herein were taken by CTA Architects Engineers on June 14, 2016 unless otherwise noted.

Appendix

Cost Estimate

Clean Foundation and Adjust Irrigation System	$700
Masonry Repairs	$900
Windows Repairs	$11,750
Exterior Door Repairs	$4,900
Paint Tower	$1,500
Site Conditions	Note 1
Replace Flooring	$23,500
Wall Repair at Art Sink	$160
Storage Closet Ceiling Repair	$300
Interior Door Repair	$975
Toilet Room	Note 2
Stair	Note 2
Fire Escape	Note 2
Miscellaneous	Note 1

Note 1: Costs are considered routine maintenance.

Note 2: Costs are include in comprehensive estimates located in Part 2 of this report.

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July 6, 2016

Sky Cook and Bob Franzen
CTA Bozeman
411 E Main St, Ste101
Bozeman, MT 59718

RE: Gallatin Gateway School Building Assessment

Dear Sky and Bob,

As requested, we have completed a structural conditions assessment for the original 1914 Gallatin Gateway School building in Gallatin Gateway, MT. Jami Lorenz, PE and Samantha Fox, EI completed the assessment and this report. The site was visited on Tuesday, June 14, 2016. The findings and recommendations in this report are based on visual inspections made at the site. There were no existing building drawings available at the time of the visit. Per the scope of this assessment, no material tests were performed. The following report is a summary of our general structural observations and initial recommendations.

We understand that this report is general in nature. We are at your disposal to discuss the options for structural retrofits of the dorm to provide a general stabilization or life-safety solution for the reuse of the structure. A more in-depth structural analysis and design effort will be pursued upon your approval to create the necessary construction documents for this stabilization effort. Please contact us with any questions you may have at this time.

Sincerely,

Beaudette Consulting Engineers, Inc.

Jami Lorenz Sam L Fox

Jami Lorenz, PE Samantha L. Fox, EI

Introduction

We have completed a structural conditions assessment for the original 1914 Gallatin Gateway School Building. Jami Lorenz, PE and Samantha Fox, EI, completed the assessment and this report. The site was visited on June 14, 2016. The findings and recommendations in this report are based on visual inspections made at the site and a preliminary structural analysis. No material tests or destructive investigations have been performed at this time.

The intent of this investigation was to determine the general structural status of the original 1914 Gallatin Gateway School Building per the 2012 International Building Code (IBC) and the 2012 International Existing Building Code (IEBC) and to develop recommendations for necessary structural retrofits. The building was assessed for life-safety gravity and lateral loading as defined by the IBC. A 48 pounds per square foot (psf) ground snow load was used in this preliminary analysis per the Montana Ground Snow Load Finder. Life-safety live loading per the IBC was applied in this preliminary analysis. 40 psf at classroom spaces, 80 psf at second floor corridors, and 100 psf at first floor corridors was used. The school building is also in a high-seismic region, and is considered Seismic Design Category “D” according to the IBC.

Structural Description

Please reference the attached floor plans for a schematic of the existing framing as observed on-site. The existing exterior walls are unreinforced brick masonry, and assumed to be 12-inches thick through the height of the building. The roof and floor structures are wood-framed, and the basement walls are cast-in-place concrete.

Figure 1: North Elevation of the 1914 Gallatin Gateway School Building.

Roof Framing

The existing roof is framed with 2x6 rafters at 24-inches on-center that span from the exterior bearing walls to a ridge board or hip board. Various one-inch nominal web and collar members are nailed to the rafter members and bear at the ceiling joists.

The cupola framing consists of 2x walls that bear on the roof framing members.

Figure 2: Roof framing as seen from the attic access hatch at the second floor ceiling.

Floor Framing

The second floor framing consists of 2x12 members at 16-inches on-center and span the width of the building in the north-south direction. Horizontal 1x tongue-and-groove planking spans perpendicular to this framing. This framing was observed by removing a small portion of sheetrock at the first floor ceiling. The bearing condition could not be observed at this time.

The first floor framing was observed from the unfinished basement space below. The first floor joists are 2x12 nominal and span from the exterior north and south bearing walls to an intermediate beam that consists of 6-2x12 members. Splices at this beam are random, and therefore the beam was considered 4-2x12 for analysis purposes. This beam spans continuously over column elements spaced at approximately 12 feet on-center. These columns are approximately 9-inches square and bear on the cast-in-place concrete basement slab below. At the east and west walls, the beam pockets into the concrete basement walls.

Figure 3: Typical beam to column connection in the basement.

Foundation

The basement walls are cast-in-place concrete and are 14-inches thick. The top of concrete wall is equal to the bottom of the existing first floor joists, approximately 6-feet, 9-inches from the top of the floor slab. No footings could be observed at this time. The existing concrete floor slab showed signs of deterioration. Signs of water infiltration into the basement were also evident. It should be noted that the original window openings in the concrete basement wall have been infilled with concrete masonry units (CMU) or have been covered with plywood.

Conditions Assessment and Recommendations

Roof Framing

The existing roof framing is seriously deficient for the existing gravity and snow loads. While this method of construction is often seen in buildings of this construction type and era, signs of distress were evident and it will require structural remediation. It is worth noting, however, that no signs of failure were observed.

To retrofit the roof structure, we would recommend adding new ridge and hip beams. These members could bear on column elements supported by beams at the ceiling level that span from the north to south wall. The existing rafter elements will be 'sistered' in order to provide capacity to span from the existing brick walls to the new hip and ridge beam elements. 'Sistering' the roof joists includes gluing and nailing a new member to the existing member to increase its strength in bending. We also recommend adding new 5/8-inch plywood sheathing to the roof framing in conjunction with the next re-roof of the building.

We would also recommend supplementing the existing connection of the roof framing to the existing exterior brick walls. This would likely include adding new blocking members between existing roof framing members that are positively attached to the brick wall below with epoxy screen anchors.

The existing cupola framing should be retrofitted by supplementing connections where necessary. The base of the cupola should then be attached to a beam at the roof framing level to prevent overturning or uplift of the structure.

Floor Framing

The second floor framing was analyzed for gravity loading per the IBC life-safety level live loads described in the introduction. These members are over 80-percent overstressed for the classroom-type loading of 40 psf, and are even more deficient at corridor locations.

The first floor joists were found to be adequate for both the classroom loading as well as the first-floor corridor loading. The existing beam members were found to be overstressed for corridor loading.

It is our understanding that part of the potential future work will include adding an elevator core in the building. Because the floors are framed with wood members, the installation of a new wood-framed core would be relatively simple. The addition of this core also provides opportunity for new bearing wall elements in the middle of the structure. These walls can be used to support new beam members at the second floor that break the span of the continuous floor joists at this level and provide adequate strength for classroom-type loading. At the corridor locations, the joist members will also need to be 'sistered'. We would also recommend supplementing the connection of the existing floor framing to the existing exterior brick walls. See the schematic detail in the attached appendix for an example of this work.

At the first floor framing, the existing beams in the basement should be 'sistered' with new LVL members at corridor locations. The existing beams should also be positively attached to each of the columns by installing a toe-screwed Timberlok or lag bolt from the side of the column up into the beam. This will ensure the members stay connected in the event of movement due to a seismic event.

Likewise, we recommend that the floor joist members be positively attached to the beam and existing exterior brick wall.

Foundation

The concrete basement walls were in generally good condition. There were no signs of cracking to indicate ongoing settlement. While there were some signs of water infiltration, the concrete remained intact at these locations.

Figure 4: Area of water infiltration in the basement below.

While the basement floor showed signs of deterioration and cracking, this is not a life-safety structural issue. If the uneven floor surface becomes a serviceability issue, there are options for floor leveling using a topping slab that could be used for remediation. Steps should be taken at the exterior of the building to remediate the water infiltration issue; this would be coordinated with a civil and/or geotechnical engineer.

Exterior Brick Walls

The exterior brick walls were in generally good condition. There are a few select areas of degradation that require repair in the form of replacing or repointing the brick. In particular, the window sills have degraded due to water as seen in the figure below. The brick at these sills may need to be totally removed and replaced.

Figure 5: Brick at window sills has deteriorated.

Lateral Force Resisting System

In general, the biggest structural concern with unreinforced brick buildings is the lateral force resisting system. This type of building provides very little resistance to lateral loads particularly from an IBC design seismic event. The heavy brick building is in a high snow and high seismic region, and would produce large forces on the exterior brick walls (both in-plane and out-of-plane) in a design seismic event that could cause areas of extreme damage or partial collapse.

The new recommended attachment of the roof and floor structures to the exterior walls as discussed previously will provide stability for the walls in the out-of-plane direction. It will ensure that the floors and roof stay attached to the wall in the event of movement due to an earthquake. New plywood sheathing over the existing roof and floor sheathing at each level will also provide a code required roof and floor diaphragm at each level in conjunction with the new attachments to the exterior walls.

The current main lateral force resisting system (LFRS) is the unreinforced brick walls, which act as shear walls. While this type of system is not allowed for new structures by the IBC, the IEBC allows some leniencies for using this system in existing structures. However, if the future remodel project impacts enough of the existing structure, we will be triggered into a full IBC upgrade of the LFRS. This will likely be the case with the addition of a new elevator core. Our LFRS upgrade would then include adding new 2x4 furring walls with ½-inch sheathing at select locations at the interior of the brick walls. These furring walls would be connected to the roof, each floor system, and would extend down to the foundation. Our new elevator core walls would also serve as new wood shear walls, and would require ½-inch sheathing at one or both sides of the walls.

Conclusion

The 1914 Gallatin Gateway School building was found to be in generally good condition. The existing wood-framed roof and floor systems require upgrades to meet current life-safety level standards for dead, live and snow loading. There is ample opportunity for these improvements. The large attic space lends itself well to access for retrofits of the roof structure (1). The potential future addition of an elevator core (or stair core) provides access and bearing locations for the second floor framing upgrades (2), and the semi-unfinished basement space provides convenient access to the first floor framing (3).

The existing exterior brick bearing walls are in generally good condition, but there are some instances of deteriorated brick due to water infiltration and exposure to weather. These areas should be repaired by repointing the existing brick or removing and replacing the brick as necessary (4).

The existing lateral force resisting system requires upgrades to improve life-safety and prevent heavy damage or partial collapse in the event of a design-level earthquake. Adding sheathing to the roof (5) and floors (6) and proper attachment of the roof (7) and floor (8) structures to the existing exterior brick wall is recommended to transfer lateral forces, brace the walls out-of-plane and to provide a positive connection in the event of movement due to an earthquake. The existing brick walls may be able to be used as part of our LFRS, but the addition of an elevator core and the heavy alteration of the structure required for a potential remodel may trigger a full IBC-level LFRS upgrade. This would require the addition of wood furring walls at the interior of the existing brick walls that would be sheathed and serve as shear walls (9).

The new elevator core (or stair core) walls would also be utilized as shear walls (10).

We have broken these structural recommendations into the following categories as requested: Option 1, Option 2, and Option 3. Option 1 is to take no action at the school. Note that the IEBC does not require any structural upgrades if the existing building is not altered in any way. Option 2 is to take the minimum action necessary to improve the performance of the existing structure and basic life-safety to reduce death and injury in the event of an earthquake. Option 3 is to upgrade the structure to resist IBC-level seismic loads to improve life-safety and to minimize damage to the structure in the event of an earthquake so that the building can be brought back up to an operational level.

Option 1: Take no action.

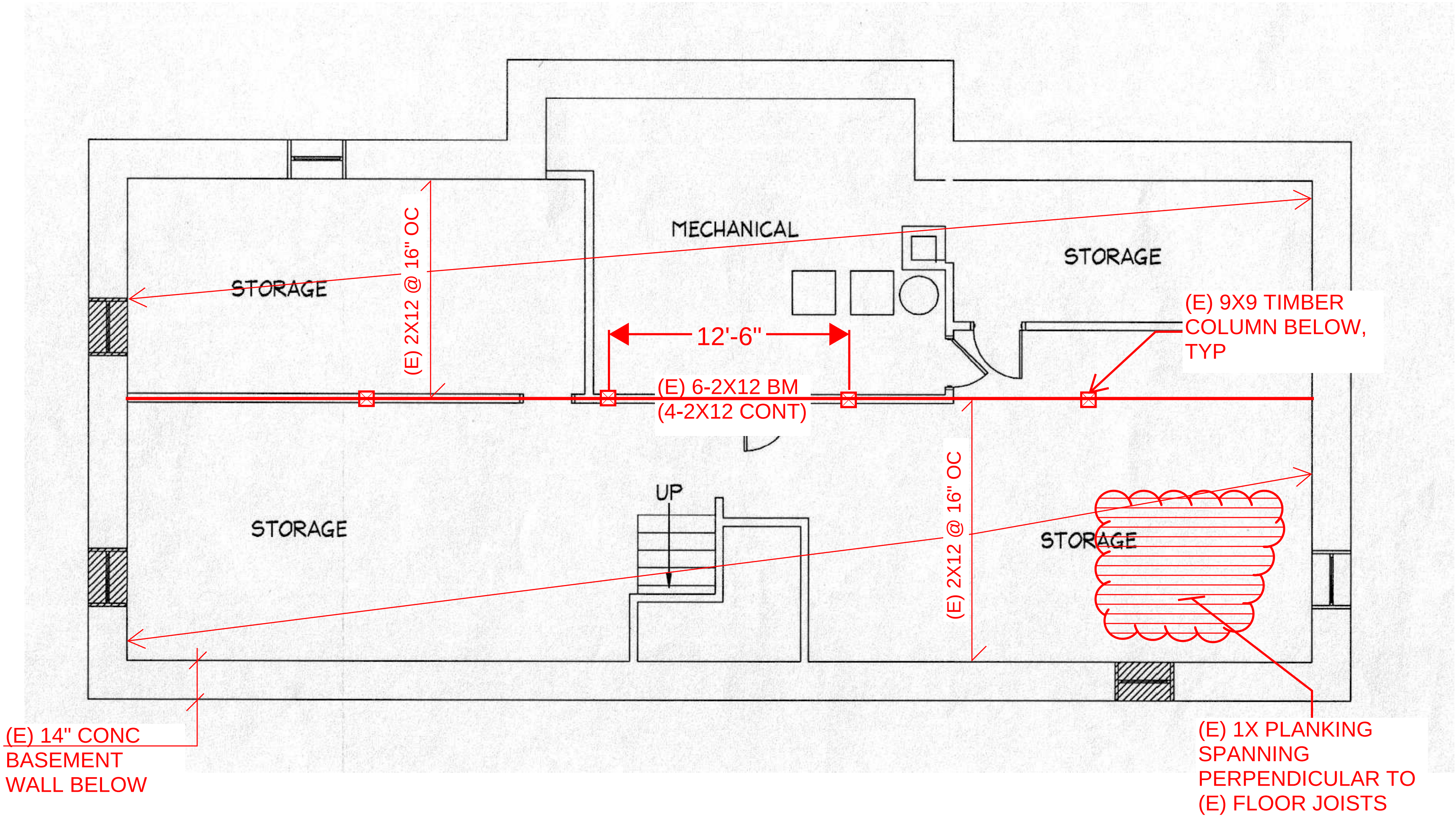
Option 2: Provide the following upgrades:

- Retrofits the roof structure for dead and snow loading (1).
- Provide new 5/8" plywood sheathing to the roof (5).
- Provide new connection at the existing roof framing to the exterior brick walls as described (7).
- Provide new connection at the existing second and first floor framing to the exterior brick walls as described (8).
- Second floor framing upgrades – including an intermediate beam and sisters to existing joists at corridors (2).
- First floor framing upgrades – including adding positive connections at beams and columns and sisters to existing joists at corridors (3).
- Provide new plywood sheathing over the existing floor planking at the first and second floor (6).

Option 3: Provide the upgrades described in Option 2 in addition to the following upgrades:

- Brick repairs including removing and replacing existing deteriorated brick or repointing existing brick (4).
- Provide a new elevator core (or stair core) with sheathed shear walls (10).
- Provide new sheathed 2x4 furring walls at the interior of the existing brick walls to serve as shear walls (9).

Structural Appendix



(E) 2X12 @ 16" OC

(E) 6-2X12 BM
(4-2X12 CONT)

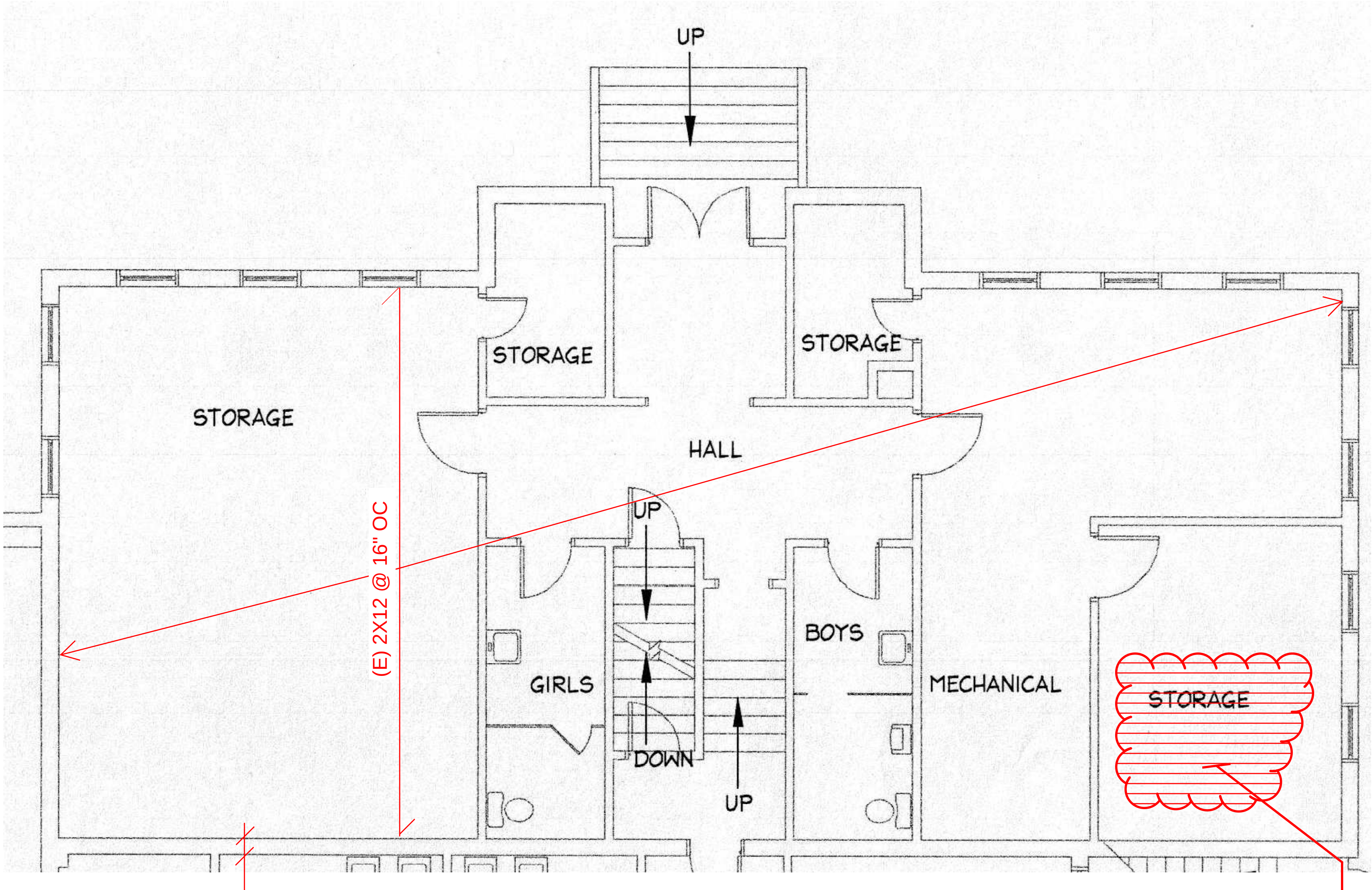
(E) 9X9 TIMBER
COLUMN BELOW,
TYP

(E) 2X12 @ 16" OC

(E) 14" CONC
BASEMENT
WALL BELOW

(E) 1X PLANKING
SPANNING
PERPENDICULAR TO
(E) FLOOR JOISTS

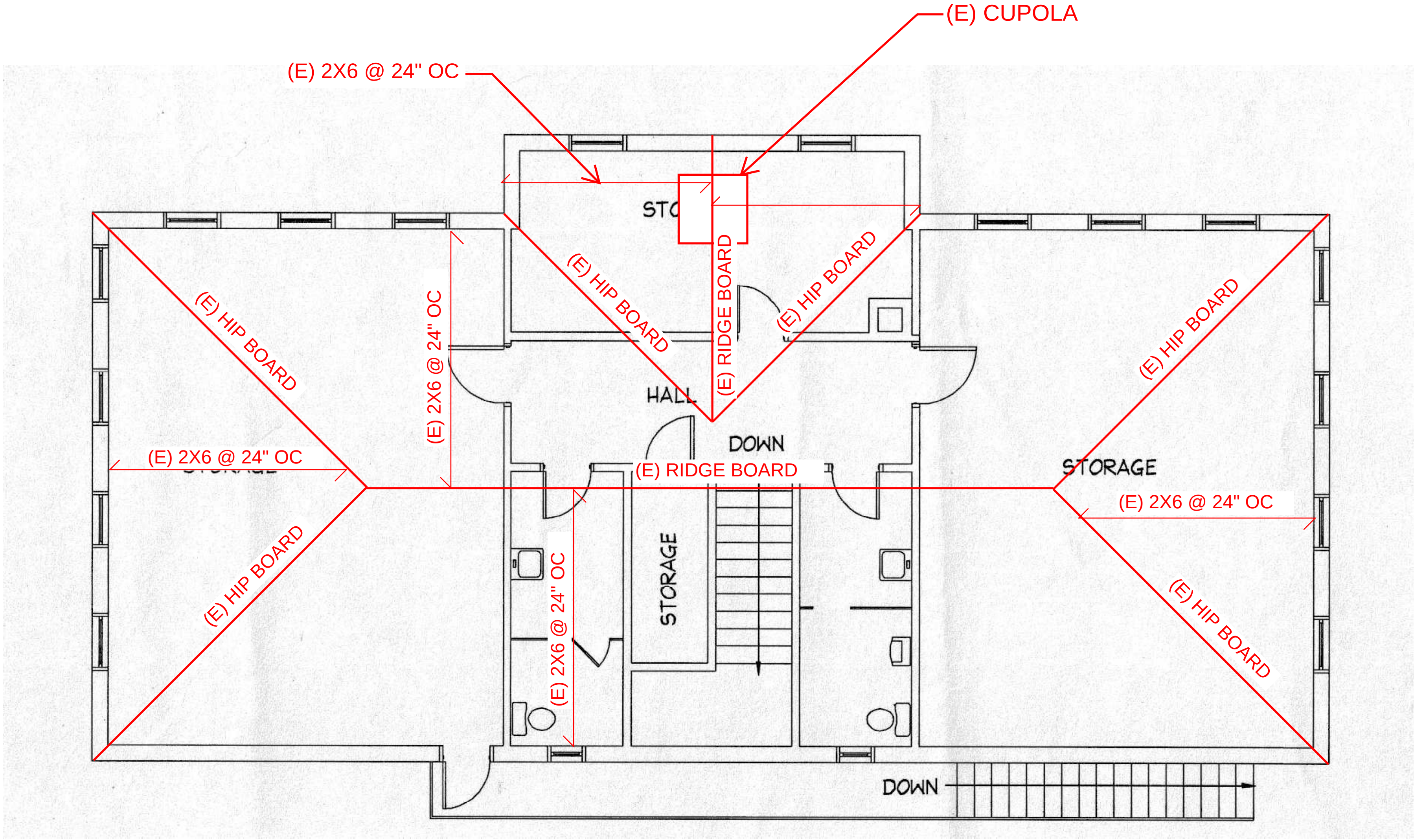
(E) FIRST FLOOR FRAMING



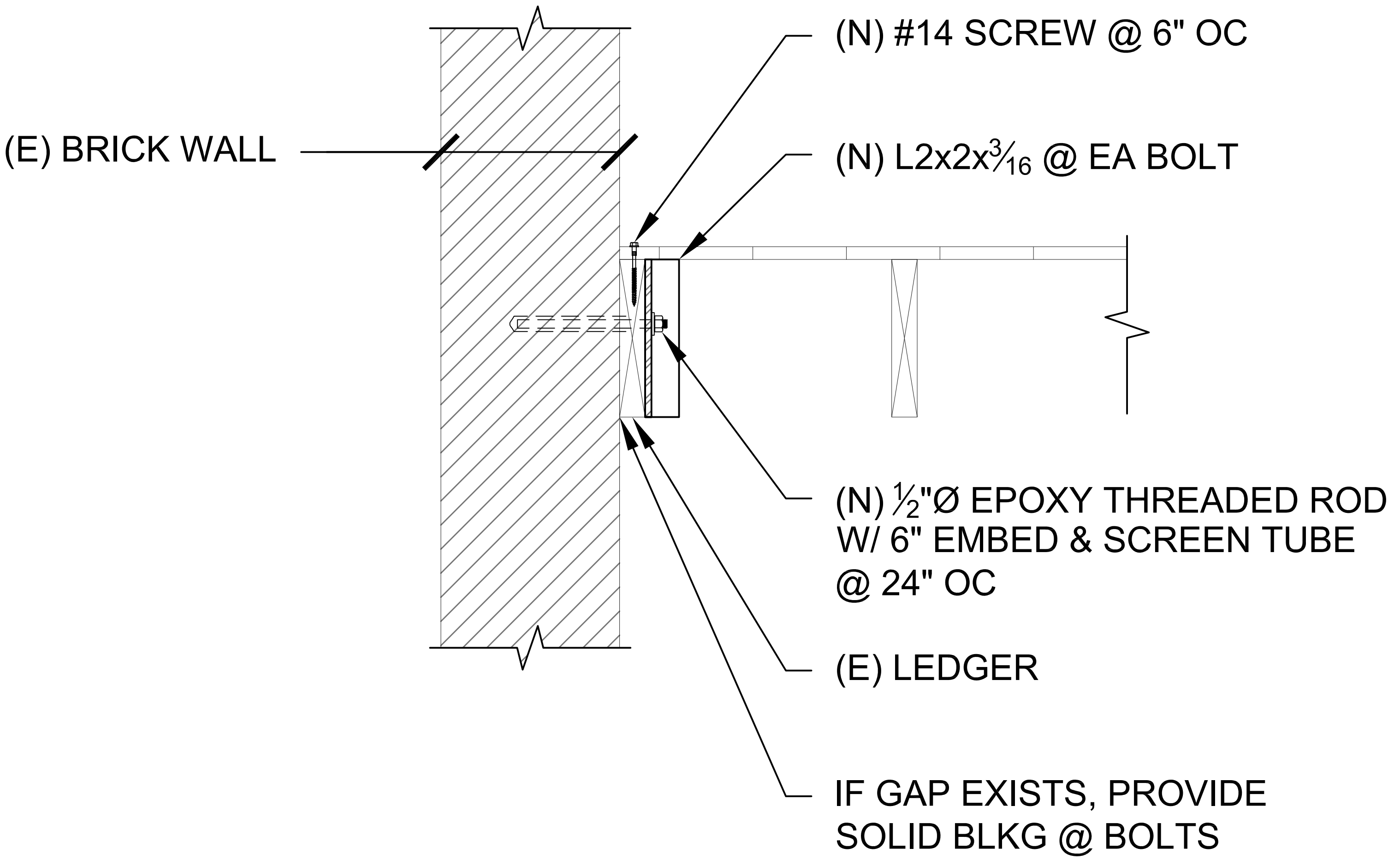
(E) 12" BRICK
WALL ABOVE AND
BELOW, TYP AT
EXTERIOR

(E) SECOND FLOOR FRAMING

(E) 1X PLANKING
SPANNING
PERPENDICULAR TO
(E) FLOOR JOISTS



(E) ROOF FRAMING



WALL TO FLOOR CONN - PARALLEL

SCALE: NTS

IV. Egress Assessment

Introduction

Statement of Purpose

CTA Architects Engineers (CTA) was engaged by the Gallatin Gateway School District in May 2016 to perform an egress assessment of the entire school building. The intent of this report is to evaluate the current condition of the egress paths and their associated construction; and to provide recommendations for providing safe, code compliant egress from the building.

General Condition Statement

The egress evaluation included a review of existing areas, occupancy classifications and egress requirements for the entire school building. The Exiting Diagram (A101) provided in the appendix provides the number of occupants exiting, travel distances and required egress widths for each door/opening. Overall, Gallatin Gateway School is currently providing ample egress locations and sizes for the buildings current use.

The total occupancy of the gymnasium is limited by the width of the existing egress doors. Permanent signage stating maximum occupancy load for this space should be located at each entry. The width of the pairs of exit doors from the gymnasium currently do not meet the 36 inch minimum required by the code. Fire rated doors (20 minute) with smoke seals are required throughout the corridors and presently exist only in the 2003 addition.

Referenced Codes and Standards

The following report may reference specific building codes and standards as they relate to this facility. These include, but are not limited to, the following:

- 2012 International Building Code (IBC)

State and local municipalities have adopted the above codes for building code compliance and accessibility standards. The existing building use / occupancy classification is Education – Group E and no change in use / occupancy is anticipated. Should the use / occupancy change, further analysis will be required.

Additional codes and standards that may be referenced include:

- American National Standards Institute, ANSI A117.1 – 2003 Accessible and Usable Buildings and Facilities (ANSI A117.1)
- 2010 Americans with Disabilities Act Standards (ADA)

In addition to the above, the school district has provided all available drawings of various additions to the 1914 original school building.

Egress Evaluation

The egress evaluation included a review of exiting requirements for the entire school building. Most of the building exiting is compliant related to occupant exiting distances and egress widths, but some areas will require improvements to meet the current adopted 2012 International Building Code (IBC).

The IBC requires 1 hour rated corridors Education – Group E buildings. Destructive investigative measures were not implemented as part of this assessment. Minor demolition of the corridor walls should be performed to determine the construction type and associated fire rating. Twenty (20) minute fire rated doors are required within 1 hour rated corridors. The doors in the 2003 addition are labeled with a 20 minute rating and have smoke seals, but all the other corridor doors do not have a fire rating label. The not labeled doors need replaced with rated doors and smoke seals to comply with the current code. The two sets of corridor fire separation doors at each of the building addition intersection are labeled as fire rated 1 ½ hour doors and comply with code.

2003 addition corridor looking east

The required width of corridors is 72" minimum. With the lockers in the hallway of the 1960's additions, the usable width is reduced to 72" but all exiting corridors in the building do meet or exceed this width.

The width of southwest and southeast pairs exit doors from the gymnasium do not meet the code required minimum. A 36 inch minimum width door is required to be classified as an exit. The current pair of doors provided have two 34 inch leafs. One door leaf would need to be at least 36" wide to comply for exiting. This also applies to the exterior door west of the Gymnasium that exits directly to the exterior.

The allowable occupancy capacity of the Gymnasium is limited by the existing egress width. The allowable occupancy of the space should be permanently posted at each exit from the Gymnasium. This is also noted on the exiting diagram A101 at the end of this section.

Gymnasium Entry Doors

The four classrooms within the 1966 addition an exit door/opening to the exterior raised above the floor level. The size and location of these appear to be replacing a former window opening in the wall. The openings are 30" wide x 63" tall and are 34.5" above the finish floor. Each door/opening has a panic hardware and stair with a handrail on the exterior side only. Currently there is no accessible route from the interior side of the room to get to the opening height. Due to the height of the sill above the finish floor the IBC requires a guard rail and handrail at these locations. The current exterior handrail does not provide guard rail protection. The required guard rail require a balustrade with limited opening. The existing stair only provides a handrail on one side of the stair.

Egress stairs require handrails on each side of a stair.

Egress doors at 1966 building

Accessibility

A basic ADA review related to egress resulted in finding limited areas in the building that didn't fully comply. The areas are noted below:

- Adequate clearance around the doors at each classroom entry in 1966 addition. Four classrooms are included.
    - Required Clearances for pull and push sides of doors does not comply..
    - Pull side to provide 18" minimum between jamb and wall
    - Push side to provide 12" minimum between jamb and wall
- The wall openings (in the 1966 addition) that provide an exit to the exterior (above the bookshelves) do not have a route from the finish floor to get up to the opening from the interior side. The exterior side includes a stair to the ground.

Recommend to provide an accessible route (stair/ramp) with guardrail and handrail for this area to be considered as an accessible exit.

Basic Architectural Code Assessment - 1914 Original School Building

The architectural portion of this assessment will focus on general issues with construction type, egress, and handicapped accessibility.

2012 International Building Code

305.1 - Use and Occupancy Group E

716.5 - Corridor Door Rating

- 20 minute rating required
- Existing doors in the original building and all additions except for the 2003 addition are not rated and thus do not comply.

803.9 - Corridor Finishes

- Corridor finishes require a minimum Class of finish materials for non-sprinkled buildings –
- Interior exit stairways and passageways - Class A
- Corridors and enclosure for exit access stairways – Class B
- Rooms and enclosed spaces – Class C

1005.1 - Minimum Egress Widths

- .3 inches per occupant – stairways
- .2 inches per occupant – all other locations

1008.1.9 - Doors Operations

- Doors to have level handle hardware. Most doors are non-compliant.

1008.1.10 - Panic and Fire Exit Hardware

- Rooms with occupant loads of 50 or more require panic hardware. Complies.

1009.7.2 - Risers Height and Tread Width

- Riser heights shall not exceed 7 inches
- Tread widths shall not be less than 11 inches

1009.7.4 - Stair Dimensional Uniformity

- Treads and risers shall be uniform in size and shape. Tolerance shall not exceed 3/8 inch. The riser height does not comply.

1012.2 - Handrails Heights

- Handrails shall be mounted 34-38 inches above the leading edge of a tread. The existing handrails do not comply.

1012.6 - Handrails Extensions

- Handrails shall return to the wall and have extension at the top and bottom of each run. The existing handrails do not comply.

1014.3 -Common Path of Egress Travel

- Common path of egress shall not exceed 75 feet – Complies

1015.1 - Spaces with One Exit

- Spaces with 50 or more occupants require two exits - Complies

1015.2.1- Exit Separation

- Two exits must be a minimum of ½ the diagonal distance apart. - Complies

1016.1 - Exit Access Travel

- Exit travel distance shall not exceed 200 feet - Complies

1018.1 - Corridor Fire Rating

- Corridor fire rating for an E occupancy non-sprinkled building is 1 hour - Complies

1018.2 - Minimum Corridor Width

- Group E occupancies with a capacity of 100 or more require 72 inch wide corridor – Complies

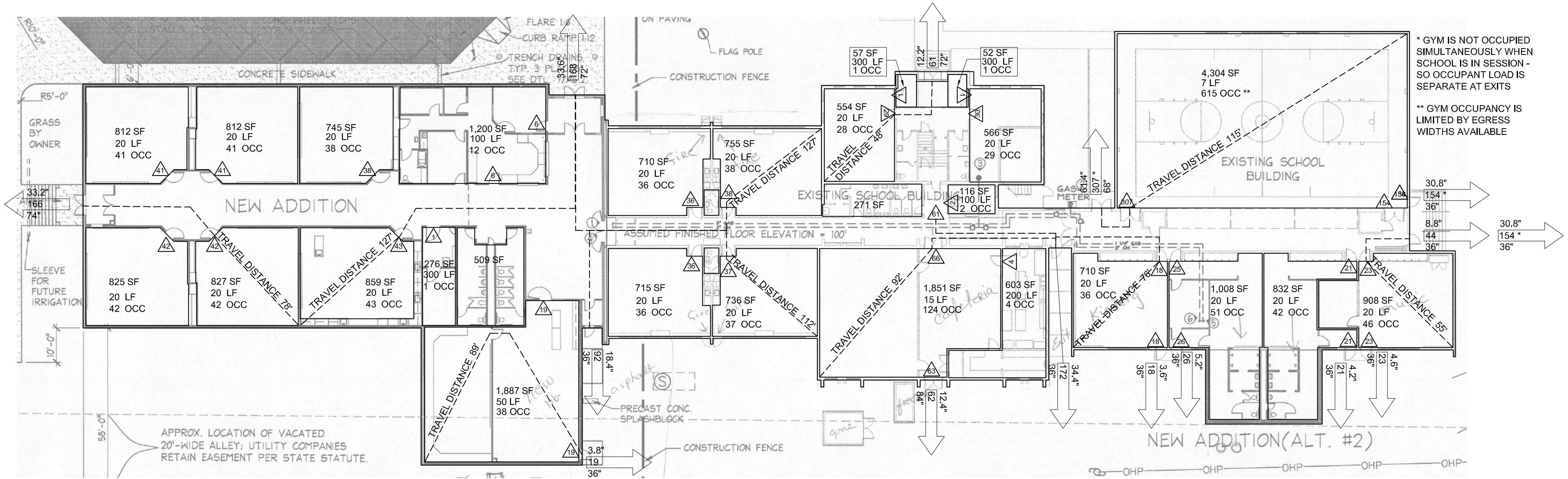
Conclusion – Code

The existing building generally meets many of the current code standards, requirements and dimensions.

Recommendations

See the recommended options indicated in Part II Code Analysis of this document

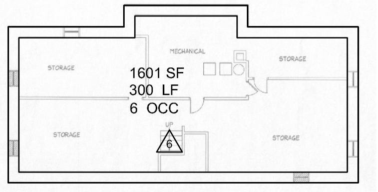
CTA



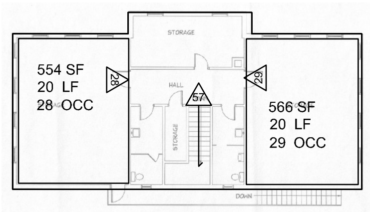
* GYM IS NOT OCCUPIED SIMULTANEOUSLY WHEN SCHOOL IS IN SESSION - SO OCCUPANT LOAD IS SEPARATE AT EXITS

** GYM OCCUPANCY IS LIMITED BY EGRESS WIDTHS AVAILABLE

1 FIRST FLOOR PLAN - EXITING DIAGRAM
A101 1/16"=1'-0"



2 BASEMENT FLOOR PLAN - EXIT. DIAGRAM
A101 1/16"=1'-0"



3 SECOND FLOOR PLAN - EXIT. DIAGRAM
A101 1/16"=1'-0"

PLAN LEGEND

EGRESS WIDTH REQUIRED
NUMBER OF OCCUPANTS EXITING
EGRESS WIDTH PROVIDED

# SF	SQUARE FEET
# LF	LOAD FACTOR
# OCC	OCCUPANCY

NOT FOR CONSTRUCTION - PRELIMINARY DESIGN

GALLATIN GATEWAY, MONTANA

GALLATIN GATEWAY SCHOOL

Proposed
Plans

06.20.16
DRAWN BY | RGS
REVISIONS
-

PLANS

A101

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VI. Crime Prevention through Environmental Design Assessment

Introduction

Statement of Purpose

CTA Architects Engineers (CTA) was engaged by the Gallatin Gateway School District in May 2016 to perform an assessment of the existing school utilizing the Crime Prevention through Environmental Design principals. The intent of this report is to evaluate the current condition of the constructed safety aspects of the school; and to provide recommendations for providing safe, environment for the occupants of the building.

General Condition Statement

Basic levels of Crime Prevention through Environmental Design (CPTED) guidelines were applied to the existing building. Some of the recommended levels of visual security recommended in the CPTED principles currently exist in the school. An example of this is to avoid blind corridors and hiding spots; the wide corridors and angled entry to classrooms of the 2003 addition provide a high level of visibility for surveillance. The main entry sequence and lobby security connection to the rest of the building could be improvement.

Basic Level CPTED Principles

CPTED is a basis of evaluation developed by the Florida Safe Schools Design Guidelines, FL Dep't of Edu. 2003. These guidelines were applied to Gallatin Gateway School.

General:

Areas identified include main, front door entry and lobby, blind corridors, restroom layouts, and classroom access. Findings for each of the areas are detailed below. Overall, Gallatin Gateway School follows many of the guidelines noted. Areas that require improvement are at the main entry and lobby.

The main entry to Gallatin Gateway School from the exterior is easy to identify and provides overhead weather protection outside to create a safe exterior waiting area. The administration is near the point of entry and has partial visibility to the exterior. The more visibility an administrator has to the exterior and interior creates greater opportunity for natural surveillance. The entry sequence from the main entry through the vestibule to the administration desk could be improved for safety by directing visitor through a single port of entry strait to the administration focal point or desk. See Entry Sequence Options at the end of this section.

Main Building Entry

The main lobby of the school is used during school and after hour use. It is important to make this area easily secured and closed off from the remainder of the school at a moment's notice to prevent unauthorized access. The design of the existing lobby would require one additional corridor to be secured (doors between lobby and 2003 addition) to follow this guideline. See Lobby sketch option in the Appendix.

Building Lobby

Blind corridors are not prevalent in the existing school. The corridor access runs primarily East/West with the exception of the main entry/lobby area. It is important to limit potential areas that someone could hide. This could include recessing the existing lockers in all the corridors. Providing more openings (doors/windows) in walls; this allows for natural visual surveillance in the building or wider corridors and angled entry doors provide open space to avoid potential hiding spots as constructed in the 2003 addition.

The existing corridors have many exit doors along the path, limiting the times they are open or how they are accessed will help direct visitors back to the main entry. This gives administration more control to monitor who is in the building.

The primary restrooms are located central to the building and close to high natural surveillance areas. The immediate adjacency to the administration office and main entry helps provide monitoring of the space.

Classroom access should be designed to be easily closed off by faculty in an emergency situation. Classrooms should also provide interior and exterior windows to enhance visual surveillance. The 2003 and 1978 additions currently have limited visibility for this type of monitoring.

CPTED Principles

The Basis of Evaluation points related to Gallatin Gateway School are listed below:

Identify front door access (main entry & lobby)

- Main entry easily identified
    - Administration near point of entry
    - Maintain visibility with administration area in/out
    - Provide overhead protection from weather at main entry
    - Large area for waiting outside of building (pick up /drop)
- Avoid hidden entries
    - Recessed areas
- Minimize unmonitored entrances
- Secure secondary entrances
- Natural surveillance (people)
    - Provide glazing or openings for visual connections
- Provide well lit areas around building
    - Exterior lighting vandal resistant
    - Lighting on timers or sensors for efficiency

Lobby

- Identify a focal point for visual surveillance at lobby
    - Administration staff to be at focal point
        - Administration as the guardian of the school
- Direct visitors through a single port of entry
    - This should be between the main entry & lobby
- Design lobby to be easily secured
    - Close off from remainder of school
    - For emergency and or after hour use of school
    - Provide a safe emergency egress route for administration to escape out of lobby area.

Blind corridors

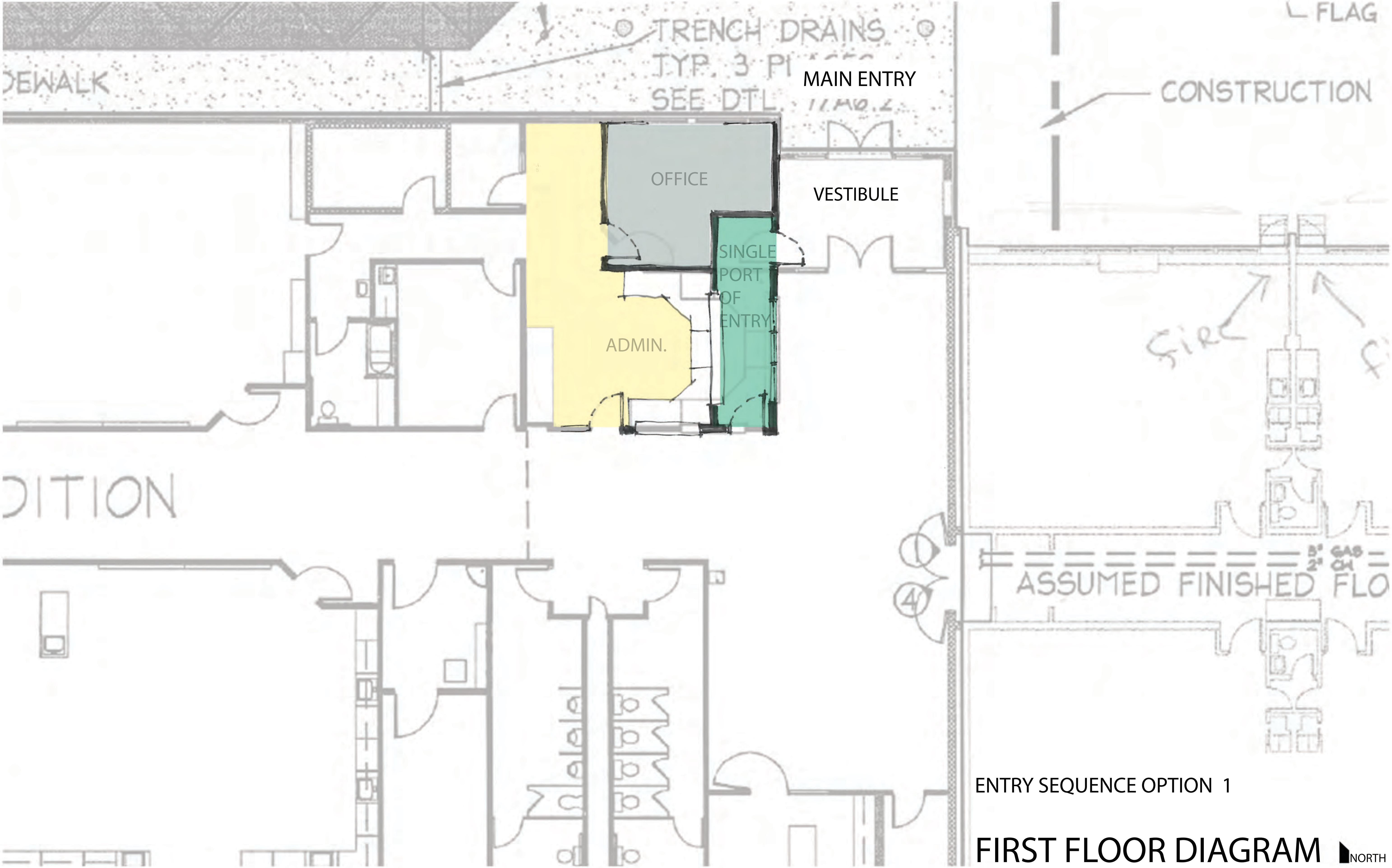
- Secure corridors to prevent unauthorized access
    - Provide easily closing doors to block off sections
    - During school and for after hour uses
- Provide openings (doors/windows) to enhance visual surveillance in corridors that run long distances or turn corners
    - Avoid 90 degree corners if possible to reduce blind spots
- Limit potential areas for hiding
- Put lockers in wide open corridors or classrooms with visual surveillance
    - Recess locker to avoid hiding spots
- Provide larger corridor widths than the minimum required when possible
- Corridors to be well lit and evenly lit.

Restroom layouts

- locate restrooms to be near natural surveillance
- design entry to restrooms to be maze like and open to the building with privacy screened partitions vs. double doors
- provide enough facilities for after school activities and in locations adjacent to space used
- vandal resistant materials, fixtures, and hardware

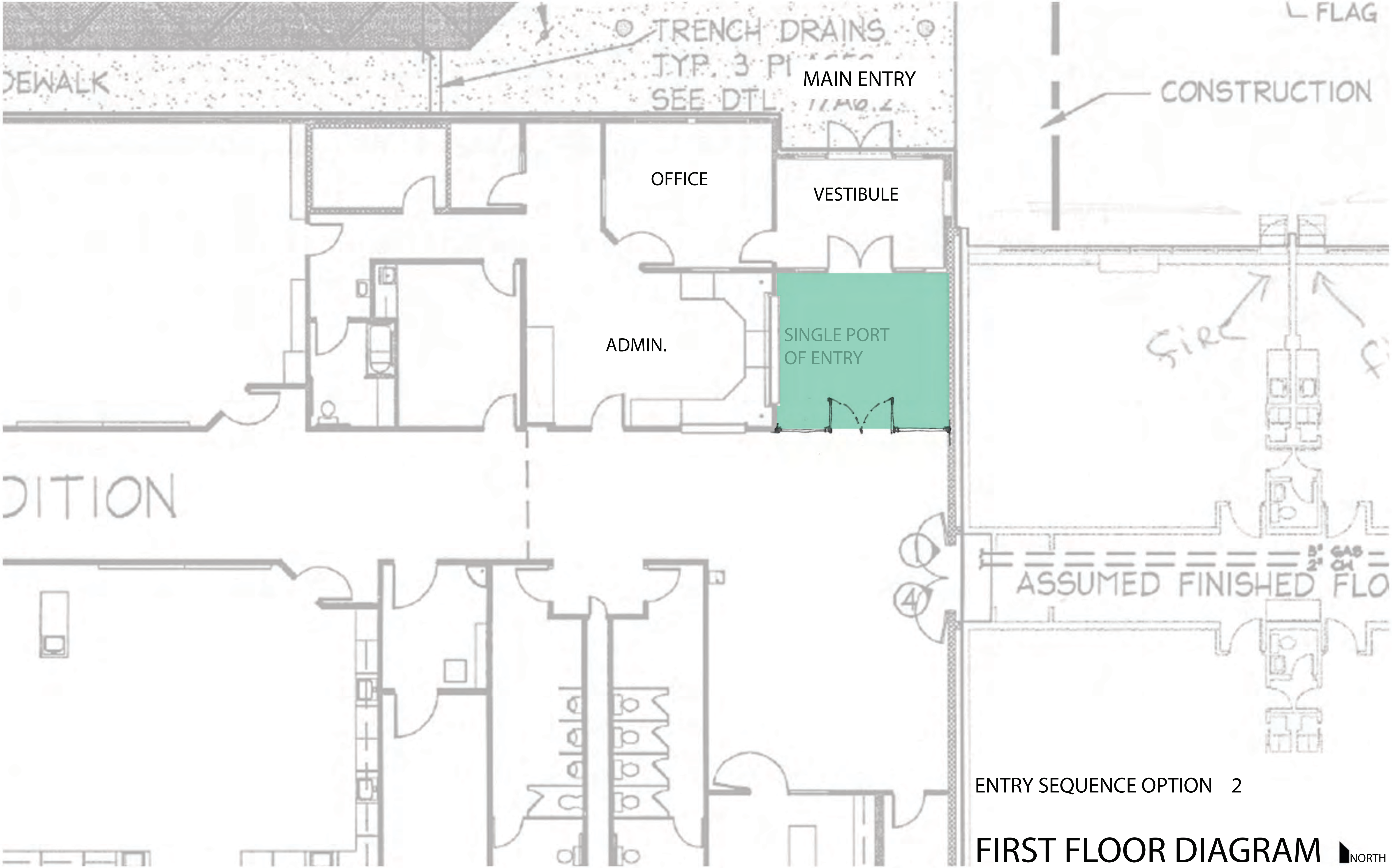
Classroom Access

- Design classrooms to be easily closed off by faculty in emergency situations
- Provide interior and exterior windows from classrooms to enhance visual surveillance with direct connections.
    - Windows into corridors & windows to outdoor space for easy monitoring
- Eliminate hiding places in rooms by making movable partitions/equipment/storage areas recessed in walls



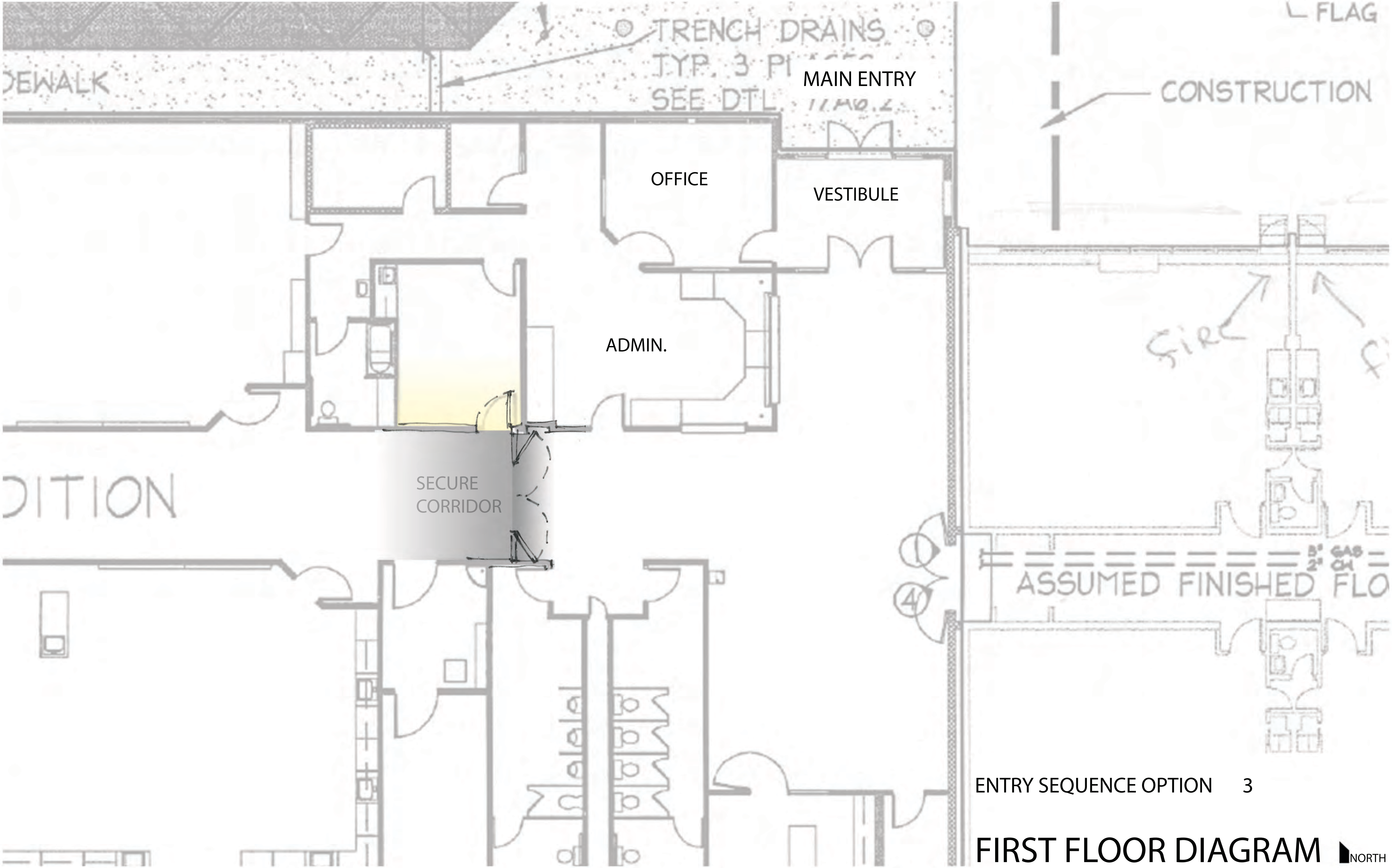
ENTRY SEQUENCE OPTION 1

FIRST FLOOR DIAGRAM



ENTRY SEQUENCE OPTION 2

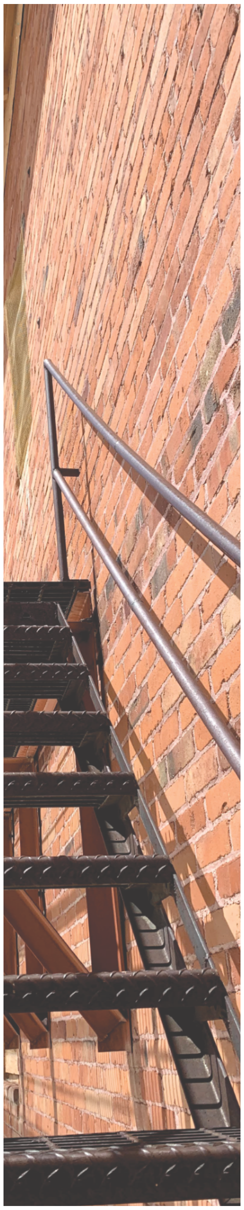
FIRST FLOOR DIAGRAM



ENTRY SEQUENCE OPTION 3

FIRST FLOOR DIAGRAM

B. Preliminary Engineering Report and Energy Audit - May 2012; prepared by CTA Architects Engineers



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Gallatin Gateway School
Gallatin Gateway Montana
Preliminary Engineering Report and Energy Audit

May 7th, 2012

Prepared For:

Gallatin Gateway School
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Gallatin Gateway School

Preliminary Engineering Report

& Energy Audit

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Executive Summary

Scope of Report:

This preliminary engineering report contains an evaluation of engineered systems at Gallatin Gateway School. The purpose of this report is to identify areas of need and develop Facility Improvement Measures (FIMs) that will improve the learning environment and reduce the energy and cost associated with operating the building. This engineering report includes an ASHRAE Level 2 energy audit.

Improvement measures identified herein were developed from existing plan review, site investigation, and energy modeling software. The existing systems investigated for the purpose of this report include heating, ventilation, temperature controls, lighting, and other systems that impact the building's environment. Facility improvement measures defined in this report address safety, comfort and energy issues.

The following outlines the approach to this study:

- Engineering survey of all existing HVAC systems at Gallatin Gateway School
- Review of available construction documents
- Performance of energy calculations including an energy model for Gallatin Gateway School
- Interview with building personnel
- Review of applicable codes

Summary:

Gallatin Gateway School has several deficiencies that are adversely affecting the learning environment. The actual energy usage of the school is fair when compared to national averages and other similar schools however there is room for improvement in some areas. Primarily, there are concerns related to indoor air quality, comfort and moisture infiltration that are addressed in the Facility Improvement Measures defined herein.

Energy / Building Evaluation

Existing Conditions:

Gallatin Gateway School's original building was constructed in 1914 with three separate additions and renovations, the last which occurred in 2001. The net floor area of the building is 33,300 square feet and the building is comprised of two floors and a basement. The ground floor includes a gymnasium, locker area, classrooms, computer room, library, administrative office area, cafeteria and kitchen, as well as miscellaneous storage areas. The 1914 building is in fairly poor condition, it has a poor thermal envelop along with original single pane windows. The upper floor of the existing building is primarily used for storage due to poor comfort conditions. The 1914 basement consists of a boiler room along with storage areas. The basement has moisture infiltration problems that have led to mold development. The gymnasium and the southeast classrooms were constructed in the 1978. The gymnasium consists of masonry block walls with loose filled cores and R-38 batt insulated, membrane roof. The east end of the gymnasium addition is below grade and has water infiltration issues stemming from poor site drainage. The 2001 classroom addition has wood framed walls with R-19 batt insulation and hardboard lap siding along with some face brick. It has an asphalt shingle roof with R-38 batt insulation. The Lighting in the entire facility is primarily accomplished with T-8 type fixtures with manual controls.

The heating requirements are met by four boilers, two in the 2001 addition and two located in the 1914 basement. Hot water boilers installed in the new addition are both Lochinvar Copper-fin II 750,000 BTU Input natural gas boilers. These boilers were approximately 82% efficient when originally installed. Heating hot water for the original building and older additions are provided by two 374,000 BTU Input natural gas boilers that are approximately 80% efficient. These boilers were installed in 2010.

The gymnasium is on a separate system and is heated by gas-fired heating and ventilation units. Also, the kitchen and cafeteria are heated by two gas fired duct furnaces. The kitchen and cafeteria are heated by a gas fired separated combustion type unit heater that does not provide outside air. A Type I kitchen hood exhausts air from cooking appliances and is not provided with make-up air thus causing a pressure imbalance with neighboring spaces.

Cooling is provided for only one space, the computer room. The cooling for this unit is provided by a Direct Exchange (DX) type ducted fan coil with an air cooled condensing unit located outside.

Classrooms in the 2001 Addition are served by unit ventilators and the office area, library, and computer room are served by cabinet unit ventilators located above the ceiling. These units have a set constant outdoor air ventilation rate and have the capability of an outdoor air economizer mode. This economizer mode brings in untreated outside air to cool the space when appropriate. The original building and older renovation’s spaces are heated by fan coil units. These fan coil units are recirculating only and do not have outdoor air ventilation capabilities. Miscellaneous spaces throughout the building such as storage areas, vestibules, and locker rooms are heated by cabinet unit heaters and fin tube radiators.

The mechanical systems installed in the 2001 addition are controlled by a Direct Digital Controls (DDC) Johnson Controls Metasys System. The computer interface station is located in the janitor’s closet adjacent to the boiler room in the 2001 Addition. The remainder of the building is controlled via electric and pneumatic temperature controls that are beyond their useful life.

Domestic hot water is provided by four domestic water heaters scattered throughout the building. A 50 gallon 300,000 BTU Input hot water heater serves the 2001 Addition. The locker rooms are served by a 100 gallon, 252,000 BTU Input water heater. A 50 gallon 40,000 BTU Input hot water heater in the basement of the original building and neighboring addition spaces. Lastly, 75 gallon, 75,000 BTU Input water heater provides hot water to the kitchen. Both water heaters are regular efficiency water heaters.

Annual Energy Performance Summary

Table 1 summarizes utility information collected by CTA Architects Engineers from both Gallatin Gateway School and the utility provider, Northwestern Energy. Electric prices have ranged from $0.07 to $0.08 per kWh while demand charges are currently $8.96 per kW. This audit evaluates energy savings based upon an average of electricity consumption at a rate of $0.08 per kWh usage and $8.96 per kW demand charge. The natural gas utility provider is Northwestern Energy and usage is monitored by a single meter. Gas prices have averaged most nearly $0.70 per therm for Gallatin Gateway School. Detailed monthly utility data can be found in Appendix A.

ENERGY TYPE	TOTAL ANNUAL USE	UNITS	CONVERSION FACTOR TO (kBTU)	THOUSAND BTU (kBTU)	TOTAL ANNUAL COST ($)
ELECTRIC	193,600	KWH	3.412	660,563	$20,045
NATURAL GAS	16,855	THERM	100	1,685,500	$15,562
				2,346,063	$35,607

Table 1: 2011 Actual Energy Summary

Energy and Cost Indices

Table 2 summarizes the energy usage factors for Gallatin Gateway School. The Energy Utilization Index (EUI) allows comparison of the energy usage of Gallatin Gateway School with that of another building of the same size and similar operating conditions. A building with a lower EUI is more efficient than a building with a higher EUI. Efficient school buildings similar to that of Gallatin Gateway School have EUI ratings less than 60, however many factors come into play such as air conditioning and building utilization (occupancy, lighting loads, equipment operation, etc.). The average for energy utilization in education facilities similar to Gallatin Gateway School is 75. Refer to Appendix A for actual data from other school facility audits.

Building	Building Area (ft^2)	Energy Utilization Index (EUI) ($kBTU/ft^2/yr$)	Cost Index ($\$ / ft^2 / yr$)	Max Electrical Demand (kW)	Max. Watts per ft^2	Min. Electrical Demand	Min Watts per ft^2
Gallatin Gateway School	*33,300*	*70.45*	*$1.06*	*64*	*1.92*	*30*	*0.90*

Table 2: Energy Usage Factors

Results are based on actual usage and cost obtained from utility bill data.

Energy Star Comparison

Table 3 compares the total energy usage of Gallatin Gateway School to normalized facilities using the Department of Energy's "Target Finder". The Target Finder normalizes weather data for a typical K-12 school to make a comparison of energy usage of an average school versus that of an energy star rated school. This information is used to indicate potential savings in energy consumption. Table 3 compares the energy usage of Gallatin Gateway School to that of a median school in the United States of the same size and location as well as how much Gallatin Gateway School would need to reduce energy consumption if obtaining an Energy Star rating were desirable. Refer to Appendix A for Energy Star Target Finder results.

Energy	Gallatin Gateway School	Median K-12, Facility, Site Adapted (DOE)	Energy Star Rated Building, Site Adapted (DOE)
Site Energy Use Intensity (kBTU/ft^2/yr)	70 (EUI)	77 (EUI)	60(EUI)
Total Annual Site Energy (kBTU)	2,346,063	2,556,732	1,999,354
Total Annual Energy Cost ($)	$34,867	$37,998	$29,714

Table 3: Energy Star Rating

Energy Evaluation Procedure

In order to evaluate energy savings, Trane "Trace 700" energy modeling software was utilized for analysis of most conservation measures. All spaces and systems in Gallatin Gateway School were input into the modeling software. Construction features from building documents were used to input proper insulation values, windows and floor areas. Reasonable engineering assumptions were made where information was not available for building components. HVAC system components were input down to the room level with occupied and unoccupied settings, temperature set points, and building schedules information obtained from people with knowledge of building operations. Some of the inputs were based on engineering assumptions and are therefore considered estimates and actual savings cannot be guaranteed. Lighting wattages are assumed with values from ASHRAE 90.1 taken into consideration. Table 4 compares actual building energy consumption compared to calculated building energy consumption via the Trane Trace 700 energy model. Output from the energy modeling software can be found in Appendix C. The table below shows how the energy model year gas and electrical usage compares to 2011 data.

ENERGY TYPE	ACTUAL ANNUAL ENERGY USE	CALCULATED ANNUAL ENERGY USE	UNITS	ACTUAL TOTAL ANNUAL COST ($)	CALCULATED TOTAL ANNUAL COST ($)
ELECTRIC	193,600	192,693	KWH	$20,045	$21,142
NATURAL GAS	16,855	15,207	THERM	$15,562	$14,574
				$35,607	$35,716

Table 4:
Actual Energy Consumption vs. Base Model Calculated Consumption

Facility Improvement Measures

FIM #1: Upgrade Building Ventilation System

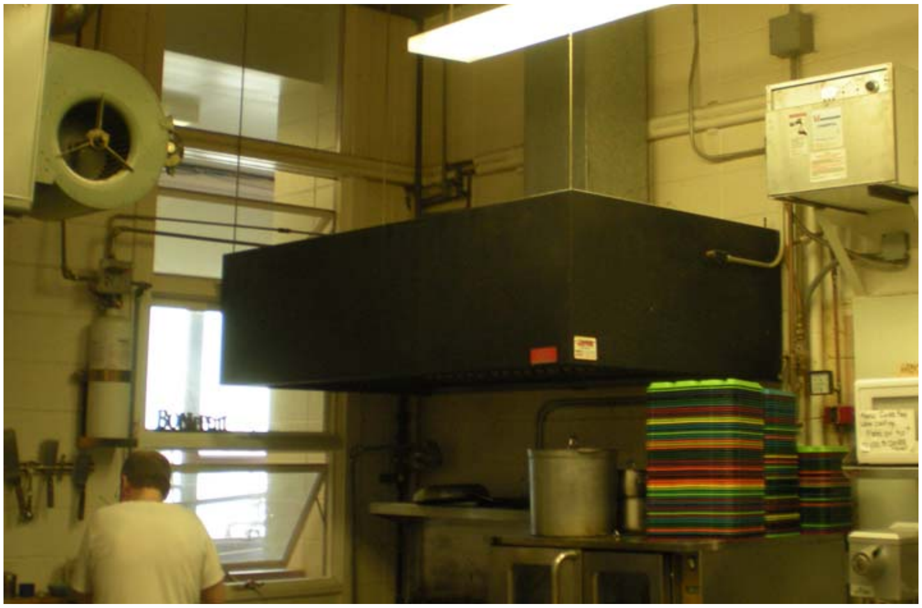
Deficiency:

Currently, the entire building is negatively air pressured causing cold drafts during winter months that create an uncomfortable building. This air pressurization issue is being caused by a lack of outdoor ventilation air being brought into the building. The problem is increased when the kitchen exhaust hood is utilized. The 2001 addition brought ventilation air via unit ventilators into the building however, it is not enough to offset the rest of the building. In fact, the three unit ventilators on the North Side of the 2001 addition have outdoor air intakes that are five feet from the parking lot. These units have drawn car exhaust fumes into the classroom from the parking lot. Besides the classrooms installed during the 2001 addition, there are not any other classroom that have mechanical ventilation.

North Classroom Air Intakes

Recommendation:

The lack of proper make-up air for the Kitchen exhaust hood is a code violation and should be addressed. CTA recommends that a new gas-fired make-up air unit is installed to provide proper make-up air for the Kitchen. The new make-up air unit would be located on the roof near the kitchen and be interlocked with the kitchen hood exhaust fan. This will address the air deficiency associated with the kitchen hood system. As part of this facility measure to upgrade the building's ventilation system, we recommend blocking the outside air intakes on the three north unit ventilators near the parking lot. In order to replace the ventilation air lost by doing this we recommend installing a heat recovery ventilator on the roof near the two toilet rooms. This ventilator would recover heat from the existing toilet exhaust and bring ventilation air directly to the classroom. This is otherwise known as a dedicated outdoor air system. Outside air would then be brought in from the roof level and not at parking lot level. The last part of this ventilation upgrade would include adding mechanical ventilation to the four classrooms between the library and the cafeteria along with adding ventilation to the two classrooms near the locker rooms. Ventilation would be accomplished via small rooftop heat recovery ventilators. Exhaust heat would be recovered and put back into the new ventilation air stream. This measure will have a positive impact on the indoor air quality and slightly increase energy usage. Refer to Appendix D for further detail on implementation costs and Appendix C for energy reduction calculations.



Kitchen Exhaust Hood

Ventilation Upgrade Costs:

Estimated First Cost	$109,406
Estimated Annual Energy Savings/Cost	$-525

FIM #2: Gym H&V Unit Upgrade:

Deficiency:

One of the two existing gym air handling units has failed making it difficult to maintain temperature in the gymnasium. The units were originally installed in 1979 and have an existing electric / pneumatic control system. These units are inefficient, beyond their useful life and in need of replacement. Duct furnace sections in units of this age are subject to heat exchanger failure which can reduce indoor air quality by admitting products of combustion to the spaces they serve.

Recommendation:

We recommend replacing both gym H&V Furnace sections with new heating water coils that are served by the existing boiler water system. This would eliminate the duct furnace heat exchanger and the possibility of flue gas contamination. The existing boilers in the 2001 addition are large enough to handle the extra load imposed by the gymnasium. In fact, if redundancy was not an issue the Lochinvar Boilers are large enough to serve the entire facility. In order to accomplish this measure new piping will need to be extended from the existing boiler room to the gymnasium. The units will be equipped with digital controls for staging and CO2 monitoring to admit appropriate amounts of outdoor air to the gym. Refer to Appendix D for detailed break out of costs.

Gymnasium H&V Unit

Gym H&V Unit Upgrade Costs:

Estimated First Cost	$55,284
Estimated Annual Energy Savings	$1,000

FIM #3: Upgrade Building Temperature Control System

Deficiency:

The 2001 addition to the building incorporated a limited digital temperature control system for the new areas. The rest of the building remains with either pneumatic or electric controls. The areas served by the original temperature control system are very uncomfortable as these systems have essential failed and manual control is prevalent. There are no means of night set back or other energy reduction features. The administration area is another area that is in need of temperature improvement. Several interior spaces such as the conference room have been put on the same temperature control zone as the exterior office spaces. This makes the conference room and adjacent interior spaces very hot in the winter months when the exterior spaces require heating. The library and the interior restrooms have a very similar issue. Because of deficient temperature controls the heating coil in the unit ventilator that serves the computer lab has frozen. The computers provide the only heat source in the room and it has been very uncomfortable during colder outdoor ambient conditions.

Class Room Fan Coil

Recommendation:

We recommend that the remainder of the building is installed with a new temperature control system that will improve both comfort and efficiency of the older classrooms, and cafeteria. The old fan coil units will be upgraded with new digital controllers to allow for better comfort and energy efficiency. As part of this recommendation, the zoning issue with the conference room and interior restrooms will be repaired by installing a small unit ventilator dedicated to these interior spaces that do not have significant heating requirements in the winter. This will improve comfort conditions in these spaces.

Temperature Control Costs:

Estimated First Cost	$ 58,586
Estimated Annual Energy Savings	$2,838

FIM #4: Boiler System Upgrade

Even though the two boiler plants in the building are fairly new they are not very energy efficient and already have a history of high maintenance. We normally wouldn't recommend a boiler replacement for equipment that is 10 years old but given the history of high maintenance and this building's ability to take advantage of low-temperature high efficiency boilers we recommend that the existing Lochinvar Boilers be replaced with new high efficiency condensing type boilers to serve the entire school. Under this improvement two new 800 MBH condensing type boiler would be installed. Main distribution piping would be extended to the basement mechanical room to turn the Burnham boilers into a back-up boiler plant. This measure would consolidate the boiler plants such that the entire facility was served by the new condensing boilers.

Lochinvar Copper Finned Boiler Installed 2001

Boiler Upgrade Costs:

Estimated First Cost	$ 145,745
Estimated Annual Energy Savings	$2,935

FIM #5: Lighting Controls

This measure proposes to install low voltage digital room controls with ceiling occupancy sensors and dual level wall controls for the lighting in the classrooms and offices. In the locker rooms and restrooms, wall and/or ceiling mounted ultrasonic type occupancy sensors are proposed. The area of the classroom would determine the type and quantity needed to provide adequate coverage for the space. In the offices, meeting rooms, and smaller spaces a wall mounted dual technology line voltage sensor would be installed to replace the existing wall switches. In the corridors spaces, and gymnasium areas, this measure proposes installing a lighting relay panels with low voltage override switches for the gymnasium, and corridors. The relay panel would need to have an astronomical time clock. The time clock function would allow for sweeping lights in these areas off per assigned scheduling. The relay panel would utilize low voltage override control switches for the corridors and gymnasium areas. The switches are connected to the panel via category 5e cables.

Lighting Control Costs:

Estimated First Cost	$ 20,709
Estimated Annual Energy Savings	$2,168

FIM #6: Crawl Space Ventilation

Deficiency:

The existing crawl space ventilation system has failed which is causing mold growth and damage to the floor tiles directly above. The exhaust fans that serve the crawl space are not tied to the building's digital control system and do not have alarms in place to notify maintenance staff when they have failed.

Damaged Floor Tiles

Crawl Space Mold

Recommendations:

This improvement measure proposes to connect the existing crawl space ventilation system to the buildings digital control system and provide an output to a visual alarm in the boiler room indicating failure. This way the building maintenance staff will be alerted when the ventilation system has failed. A humidistat would also be placed in the crawl space to control the operation of the ventilation fans. The original design called for the fans to operate continuously.

Crawl Space Ventilation Costs:

Estimated First Cost	$ 2,551

FIM #7: Remediation / Repair of Storm drainage intrusion at east entrance

Deficiency:

Interior flooding has been problematic at the eastern, below grade access, adjacent to the gymnasium. A concrete stairwell descends approximately 5 vertical ft to the landing. A concrete pad has been poured at the top of the stairs, but appears to be settling, and sloped towards the stairwell. On-site investigation determined that a large portion of the storm drainage from the access road was ultimately being directed towards the stairwell. An exterior floor drain has been installed, but due to the large volume of sediment likely being transported with each storm event, has either failed or become clogged. At a minimum, it is recommended that the floor drain be inspected and cleaned out to the most realist extend possible. South of the stairwell, and behind the building, the parking area has been paved with a storm drainage catch basin being observed.

Recommendation: Three remediation options, along with the associated costs and benefits, have been explored and presented here within.

Option 1 – Interim Remediation:

This option will construct an earthen conveyance "ditch" that should begin approximately 25-30 ft north of the stairwell. The shape can be designed to maintain accessibility, but should be a minimum of 6 inches deep by 18 inches wide. The purpose for this option would be to intercept any storm drainage, directing it away from the stairwell and towards the existing catch basin. Estimated Magnitude of Cost: $4,300

Option 2 – Concrete Curb and Gutter:

This option would utilize a concrete curb and gutter or conveyance channel, similar to option 1. The benefit of the concrete structure would be the longevity, durability and ease of maintenance. The overall length and grade of the conveyance channel could be established on-site by a competent concrete contractor. Estimated Magnitude of Cost: $5,300

Option 3 – Full pavement section with Concrete Curb & Gutter:

This option would have the concrete curb and gutter installed as described in option 2, along with paving the existing gravel surface. Additionally, a concrete apron would be provided at the main road. The proposed asphalt paving would match up with the existing, and would provide a seamless transition to the southern end of the building. Along with this option, it is recommended that a topographical survey be prepared of the area, and a engineered design be carried out. Estimated Magnitude of Cost: $18,500

Proposed Drainage Improvement

Improvement Measure Ranking

The following improvement measures are ranked based upon the engineers opinion of importance. This list is somewhat subjective, however gives the reader an understanding of what the engineering team believes is the most important to the school's learning environment. The ventilation upgrade was ranked the highest because we believe it has the most impact on indoor air quality and comfort more than any other improvement measure. Temperature controls will also have an impact on the comfort in the school however, we felt it was important to address the crawl space ventilation and storm drainage issues first.

Rank	***Improvement Measure Title***	***Probable Construction Cost***	***Estimated Annual Cost Savings***	***Simple Payback***
1	FIM #1 – Ventilation Upgrade	$109,406	$ NA	NA
2	FIM #6 – Crawl Space Vent	$2,551	$ NA	NA
3	FIM #7 – Storm Drainage	$18,500	$ NA	NA
4	FIM #3 – Temp Control	$58,586	$2,838	20 years
5	FIM #2 – Gym Heat	$55,284	$1,000	NA
6	FIM #5 – Lighting Controls	$20,709	$2,168	9.5 years
7	FIM #4 – Boiler Replacement	$145,745	$2,935	NA
	Total	***$405,529***	***$8,941***	

Conclusion

There are several measures that can be taken to help improve the learning environment and reduce energy usage at Gallatin Gateway School. This not only includes the measured identified above but also operational considerations. In many cases the biggest step in reducing energy consumption is reducing operational hours by making sure that equipment is only utilized when it is needed. Educating the building users about importance of shutting down lights and exhaust devices can make significant improvements. An inventory of electrical devices can be taken and used to determine the exact operational needs. The building owner can then work with the temperature control contractor to develop more exact operational schedules and possibly implement overrides to handle unexpected events. This again takes user education so that they may understand how to override systems when they are needed during non-typical times. The measures above all require upfront capital. However, our experience has been just operating the systems only when needed has the greatest payback.

APPENDIX A

Gallatin Gateway School

Gallatin Gateway, MONTANA

UTILITY DATA

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Electrical Usage ……………………………………………………………………………………… **A2**

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Energy Comparison Similar School Facilities ………………………………………… **A5**

Gallatin Gateway School Natural Gas Usage

Natural Gas Provider: NorthWestern Energy

Read Date	Bill Period (days)	Natural Gas Cost ($)	Natural Gas Usage (Therms)	Natural Gas Unit Cost ($/Therm)	Natural Gas Avg Use (Therms/day)	Heating Degree Days (HDD)	Therms/HDD
12/29/2011	32	$1,065.78	2,508	0.425	78.4	1127	2.23
11/29/2011	32	$1,793.58	1,935	0.927	60.5	919	2.11
10/28/2011	29	$888.79	847	1.049	29.2	460.00	1.84
9/29/2011	30	$276.94	138	2.007	4.6	96.00	1.44
8/30/2011	32	$352.73	207	1.704	6.5	0.00	#DIV/0!
7/29/2011	30	$373.92	226	1.655	7.5	0.00	#DIV/0!
6/29/2011	29	$724.86	551	1.316	19.0	126.00	4.37
5/31/2011	32	$1,349.90	1365	0.989	42.7	355.00	3.85
4/29/2011	29	$1,691.52	1,733	0.976	59.8	608.00	2.85
3/31/2011	32	$2,094.51	2,165	0.967	67.7	734.00	2.95
2/27/2011	31	$2,566.94	2,692	0.954	86.8	1044.00	2.58
1/27/2011	29	$2,383.38	2,488	0.958	85.8	1047.00	2.38
	367	15562.85	16855			6516	2.59
12/29/2010	29	$2,254.42	2,538	0.888	87.5	1130.00	2.25
11/30/2010	33	$1,944.86	2,251	0.864	68.2	948.00	2.37
10/28/2010	29	$506.35	519	0.976	17.9	307.00	1.69
9/29/2010	29	$144.65	124	1.167	4.3	117.00	1.06
8/31/2010	32	$110.49	22	5.022	0.7	41.00	0.54
7/30/2010	30	$132.15	43	3.073	1.4	21.00	2.05
6/30/2010	29	$519.15	824	0.630	28.4	111.00	7.42
6/1/2010	32	$485.09	751	0.646	23.5	412.00	1.82
4/30/2010	30	$1,023.19	1,264	0.809	42.1	503.00	2.51
3/31/2010	29	$1,293.19	1,523	0.849	52.5	677.00	2.25
3/2/2010	32	$1,931.22	2,251	0.858	70.3	908.00	2.48
1/29/2010	31	$1,871.03	2,250	0.832	72.6	1055.00	2.13
	365	12215.79	14360	0.850681755		6230	2.30
				1.385			

Gallatin Gateway School Electrical Usage

Electrical Provider NorthWestern Energy

Read Date	Bill Period (days)	Total Cost	Usage Cost	Demand Charge	KWH	Electric Unit Cost ($/KWH)	KW	Demand Cost $/KW	Elect. Use (KWH/day)	Elect. Avg Cost ($/day)
12/29/2011	32	$1,745.50	$1,278.00	$467.50	17,040	0.075	55.000	8.500	532.5	54.55
11/29/2011	32	$1,862.00	$1,386.00	$476.00	18,480	0.075	56.000	8.500	577.5	58.19
10/28/2011	29	$1,675.50	$1,191.00	$484.50	15,880	0.075	57.000	8.500	547.6	57.78
9/29/2011	30	$1,647.00	$1,188.00	$459.00	15,840	0.075	54.000	8.500	528.0	54.90
8/30/2011	32	$1,373.50	$957.00	$416.50	12,760	0.075	49.000	8.500	398.8	42.92
7/29/2011	30	$921.00	$666.00	$255.00	8,880	0.075	30.000	8.500	296.0	30.70
6/29/2011	29	$1,179.50	$729.00	$450.50	9,720	0.075	53.000	8.500	335.2	40.67
5/31/2011	32	$1,846.50	$1,362.00	$484.50	18,160	0.075	57.000	8.500	567.5	57.70
4/29/2011	29	$1,899.00	$1,389.00	$510.00	18,520	0.075	60.000	8.500	638.6	65.48
3/31/2011	32	$1,915.00	$1,422.00	$493.00	18,960	0.075	58.000	8.500	592.5	59.84
2/27/2011	31	$2,087.00	$1,560.00	$527.00	20,800	0.075	62.000	8.500	671.0	67.32
1/27/2011	29	$1,893.50	$1,392.00	$501.50	18,560	0.075	59.000	8.500	640.0	65.29
	367	20045			193,600					
12/29/2010	29	$1,726.00	$1,233.00	$493.00	16,440	0.075	58.000	8.500	566.9	59.52
11/30/2010	33	$2,108.50	$1,590.00	$518.50	21,200	0.075	61.000	8.500	642.4	63.89
10/28/2010	29	$1,797.50	$1,296.00	$501.50	17,280	0.075	59.000	8.500	595.9	61.98
9/29/2010	29	$1,659.00	$1,200.00	$459.00	16,000	0.075	54.000	8.500	551.7	57.21
8/31/2010	32	$1,363.00	$921.00	$442.00	12,280	0.075	52.000	8.500	383.8	42.59
7/30/2010	30	$1,169.50	$906.00	$263.50	12,080	0.075	31.000	8.500	402.7	38.98
6/30/2010	29	$1,444.50	$960.00	$484.50	12,800	0.075	57.000	8.500	441.4	49.81
6/1/2010	32	$1,789.50	$1,254.00	$535.50	16,720	0.075	63.000	8.500	522.5	55.92
4/30/2010	30	$1,839.00	$1,329.00	$510.00	17,720	0.075	60.000	8.500	590.7	61.30
3/31/2010	29	$1,731.50	$1,230.00	$501.50	16,400	0.075	59.000	8.500	565.5	59.71
3/2/2010	32	$2,084.00	$1,557.00	$527.00	20,760	0.075	62.000	8.500	648.8	65.13
1/29/2010	31	$2,018.00	$1,491.00	$527.00	19,880	0.075	62.000	8.500	641.3	65.10
	365	20730			199,560	0.075				

TARGET FINDER

PRINT FAQ FREQUENTLY ASKED QUESTIONS CONTACT US HELP

Return to ENERGY STAR Web site > **Target Energy Performance Results**

Warning: Energy rate for electricity - grid purchase varies by 24% from $0.08089852/kWh, the average rate in the 59730 zip code. [Energy source 1]

Results

The design **must** achieve a rating of 75 or higher to be eligible for "Designed to Earn the ENERGY STAR".

View Statement of Energy Design Intent

NOTE: Values are 28% Electricity - Grid Purchase and 72% Natural Gas. The Target & Median Building energy use for this facility are calculated based on fuel mix of input estimated energy use.

Results for Estimated Energy Use

Energy	**Design**	**Target**	**Median Building**
Energy Performance Rating (1-100)	59	75	50
Energy Reduction (%)	8	22	0
Source Energy Use Intensity (kBtu/Sq. Ft./yr)	119	102	130
Site Energy Use Intensity (kBtu/Sq. Ft./yr)	70	60	77
Total Annual Source Energy (kBtu)	3,971,000	3,384,152	4,327,583
Total Annual Site Energy (kBtu)	2,346,063	1,999,354	2,556,732
Total Annual Energy Cost ($)	$ 34,867	$ 29,714	$ 37,998
Pollution Emissions			
CO2-eq Emissions (metric tons/year)	165	141	180
CO2-eq Emissions Reduction (%)	8%	22%	0%

Facility Information Edit

Galatin Gateway School
Gallatin Gateway, MT 59730
United States

Facility Characteristics Edit

Space Type	**Gross Floor Area (Sq. Ft.)**
K-12 School	33,300

Estimated Design Energy Edit

Energy Source	**Units**	**Estimated Total Annual Energy Use**	**Energy Rate ($/Unit)**

A3

Total Gross Floor Area	33,300

* The Median Building is equivalent to an EPA Energy Performance Rating of 50.

Electricity - Grid Purchase	kWh	193,600	$ 0.100/kWh
Natural Gas	therms	16,855	$ 0.920/therms

Source: Data adapted from DOE-EIA. See EPA Technical Description.

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Energy Usage Typical Schools

School Building	Energy Utilization Rating (EUI)	Building Area (SF)	Energy Cost ($/ SF)	Heat Source	Cooling	Notes
Box Elder K-12 Complex	69	93,000	$2.05	Propane	Partial	
Columbus Elem.	58	36,942	$0.90	NG	N	
Crow Agency Elem.	132	36,020	$1.00	Coal	N	
Miles City Lincoln Elementary	67	34,000	$0.58	NG	N	Steam Radiation Heat, No Vent
Eureka Middle	92	60,765	$1.00	Fuel Oil	N	Additional biomass for heating
Fort Benton Elem.	64	53,000	$0.93	NG	N	
Fort Benton Middle/High	71	65,000	$1.06	NG	N	
Fort Smith Elem.	45	16,664	$1.40	Propane	N	
Frenchtown - South	72	99,120	$1.38	Propane	N	
Plenty Coups Elementary	97	16,800	$1.03	NG	N	
Hardin Elem.	120	26,304	$1.37	NG	Partial	
Lincoln County HS	88	90,000	$1.18	Propane	N	Additional biomass for heating
Lincoln Elem.	37	40,784	$0.96	Propane	Partial	
Poplar Elem. / Middle / High	80	202,615	$0.98	NG	Partial	
Roberts K-12	72	40,980	$1.15	NG	Partial	
Shepherd Elementary	42	29,998	$0.82	Ground Loop	Y	
Bench Elem. - Billings	75	40,120	$0.78	NG	Y	
Poly Drive Elem. - Billings	77	34,910	$0.89	NG	Y	
Washington Elem. - Billings	115	33,178	$1.14	NG	Y	
Arrowhead Elem. - Billings	60	41,714	$0.92	NG	Y	
Lewis & Clark Middle - Billings	72	150,478	$0.77	NG	Y	
Castle Rock Middle - Billings	69	107,500	$1.09	NG	Y	
Newman Elem. - Billings	97	29,647	$0.99	NG	Y	
West High - Billings	116	200,044	$0.80	NG	N	
Skyview High - Billings	73	239,000	$0.93	NG	Y	
Senior High - Billings	150	215,411	$0.95	NG	N	

Data Obtained by CTA Architects Engineers through Energy Audits and other sources

APPENDIX B

Gallatin Gateway School

Gallatin Gateway, MONTANA

Building Characteristics

Index **Page**

Building Characteristics B1

Building Use / Schedules B2

Overall Building Floor Plan B3

1991 Mechanical System Floor Plan B4

2001 Mechanical System Floor Plan B5

ASHRAE II BUILDING CHARACTERISTICS

Building ID: Gallatin Gateway School Date of Audit: May 7th 2012
City: Gallatin Gateway State/Prov.: Montana Zip/Post: 59730
Lat.: 4527N Long.: 11114W HDD[4]: 8344 (Base 65°F) CDD[4]: 283 (Base 65°F)
Gross Floor Area: [1] 40,000 ft^2 Total Conditioned Area[1]: 40,000 ft^2
Conditioned Area, [1] heated only 33,300 ft^2 Conditioned Area, [1] cooled only 759 ft^2
Conditioned Area, [1] heated & cooled: 759 ft^2
Number of conditioned floors: Above grade: 2 Below grade: 1
Year of Construction[2]: 1915, 1978, 2001
Brief Building Description: Refer to Narrative

PRIMARY BUILDING TYPE[3] (check one only)

Office
- 11 [ ] Owner Occupied
- 12 [ ]Leased (1-5 Tenants)
- 13 [ ]Leased (5+ Tenants)
- 19 [ ] Other—Define

Hotel/Motel
- 21 [ ] Motel (No Food)
- 22 [ ] Hotel
- 23 [ ] Hotel/Convention
- 29 [ ] Other—Define

Apartment
- 31 [ ] General Occupancy
- 32 [ ] Seniors Only
- 39 [ ] Other—Define

Education
- 41 [X] Elementary / Middle School
- 42 [ ] Secondary
- 43 [ ] University
- 49 [ ] Other—Define

Food Services
- 51 [ ] Restaurant - Full Service
- 52 [ ] Fast Food
- 53 [ ] Take Out
- 54 [ ] Lounge
- 59 [ ] Other—Define

Health Care
- 61 [ ] Nursing Home
- 62 [ ] Psychiatric
- 63 [ ] Clinic
- 64 [ ] Active Treatment Hospital
- 69 [ ] Other—Define

Retail
- 71 [ ] Drycleaning
- 72 [ ] Supermarket
- 73 [ ] General Merchandise
- 74 [ ] Shopping Mall Without Tenant Loads
- 75 [ ] Shopping Mall Without Tenant Lighting Loads
- 76 [ ] Shopping Mall
- 77 [ ] Specialty Shop
- 78 [ ] Bakery
- 79 [ ] Other—Define

Assembly
- 81 [ ] Theatre
- 82 [ ] Museum/Gallery
- 83 [ ] Church/Synagogue
- 84 [ ] Arena/Gym
- 85 [ ] Arena/Rink
- 89 [ ] Other—Define

Other
- 91 [ ] Laboratory
- 92 [ ] Warehouse
- 93 [ ] Warehouse—Refrigerated
- 94 [ ] Recreation/Athletic Facility
- 95 [ ] Jail
- 96 [ ] Transport Terminal
- 97 [ ] Multi-Use. Complex
- 99 [ ] Other—Define

1. GROSS FLOOR AREA is all floor area contained within the outside finished surface of permanent outer building walls including basements, mechanical equipment floors, and penthouses (*ANSI Standard Z65.1-1980, Construction Area*). No exclusions are made for shafts, stairs, or atria. CONDITIONED AREA is that area provided with heating or cooling to maintain temperature between 50°F and 86°F (*ANSI/ASHRAE Standard 105-1984*).
2. THE MEDIAN YEAR for construction of at least 51% of the conditioned space.
3. BUILDING TYPE as characterized by at least 51% of the conditioned space.

PRELIMINARY BUILDING USE [1]

Average Hours/Week: 55 Average Weeks/Year: 52
Average Number of Occupants During Normal Occupied Period: 150
After Hours Cleaning (y/n): Y

OVERALL BUILDING SCHEDULE

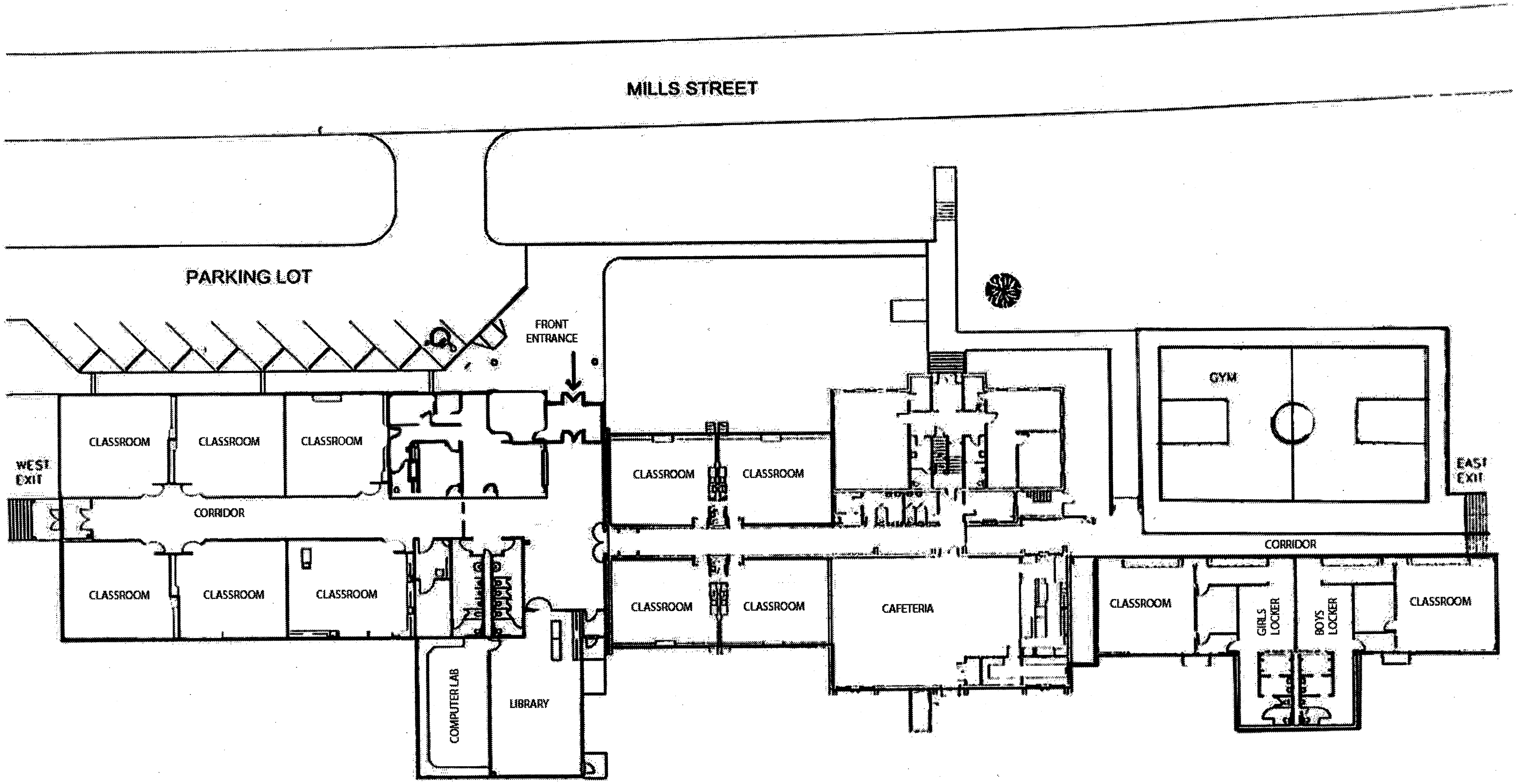
Schedule during months of School Year

Days	M	T	W	Th	F	Sat	Sun	Hol.
Hours Open	600A	600A	600A	600A	600A	X	X	X
Hours Closed	500P	500P	500P	500P	500P	X	X	X
Peak no. of occupants	175	175	175	175	175	X	X	X
Avg. no. of occupants when open	150	150	150	150	150	X	X	X

Schedule during Summer Months

Days	M	T	W	Th	F	Sat	Sun	Hol.
Hours Open	700A	700A	700A	700A	700A	X	X	X
Hours Closed	300P	300P	300P	300P	300P	X	X	X
Peak no. of occupants	20	20	20	20	20	X	X	X
Avg. no. of occupants when open	5	5	5	5	5	X	X	X

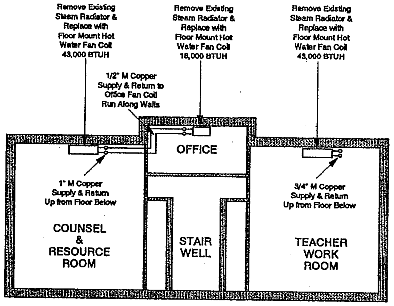
Note 1: 2001 Addition has night set back functions. Lighting is manual control, Janitors occupy building after hours.
Note 2: Boilers are shut down during the summer.
Note 3: Building has exterior walk-in freezer/cooler and computer Lab.



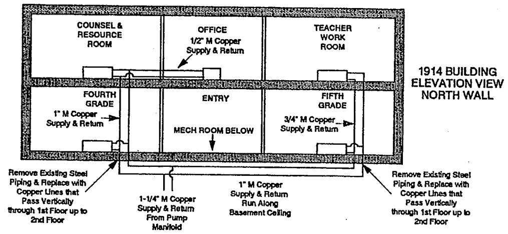
GALLATIN GATEWAY SCHOOL
OVERALL FLOOR PLAN

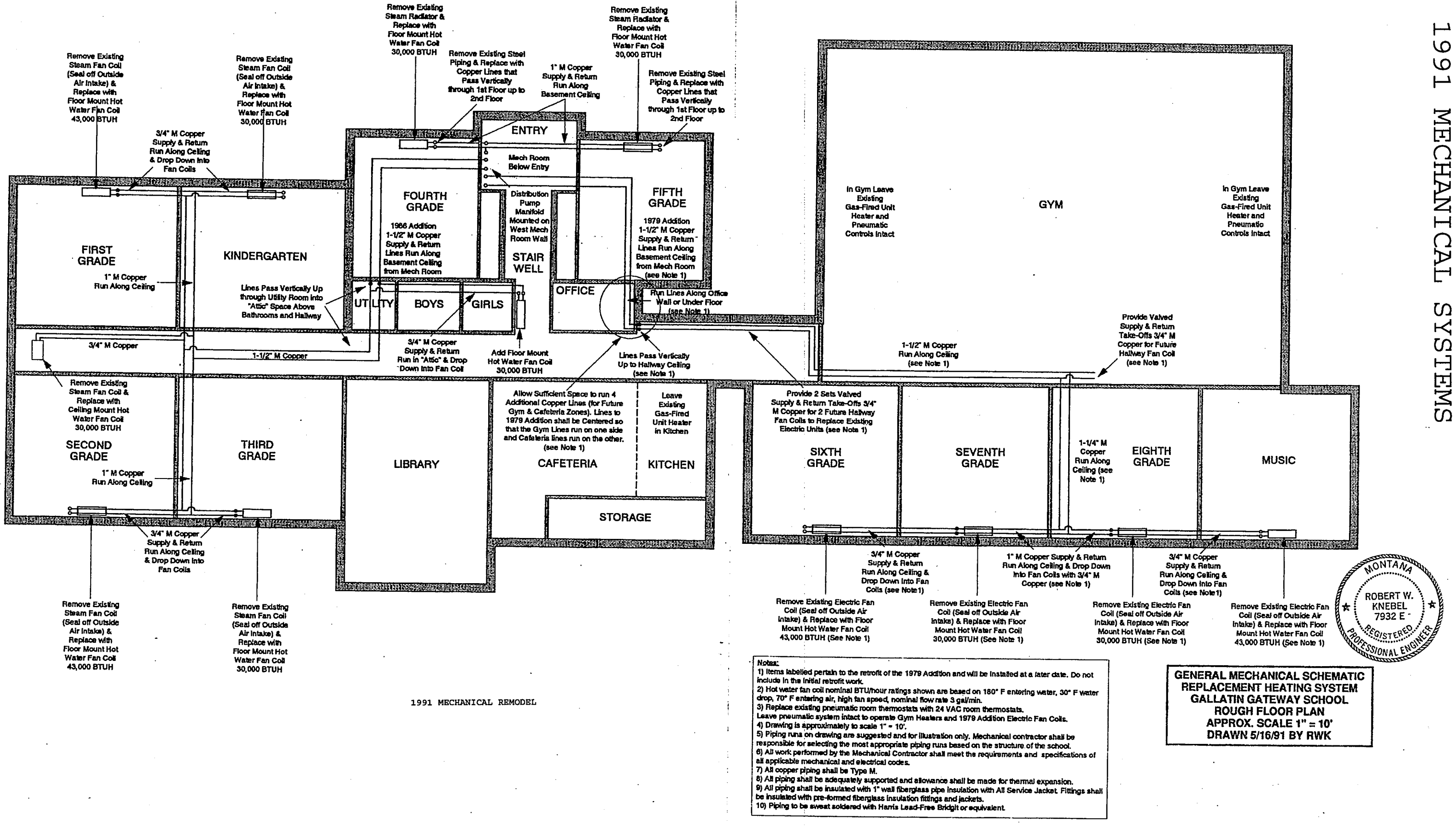
1991 MECHANICAL SYSTEMS

SECOND FLOOR
1914 BUILDING
PLAN VIEW



1914 BUILDING
ELEVATION VIEW
NORTH WALL



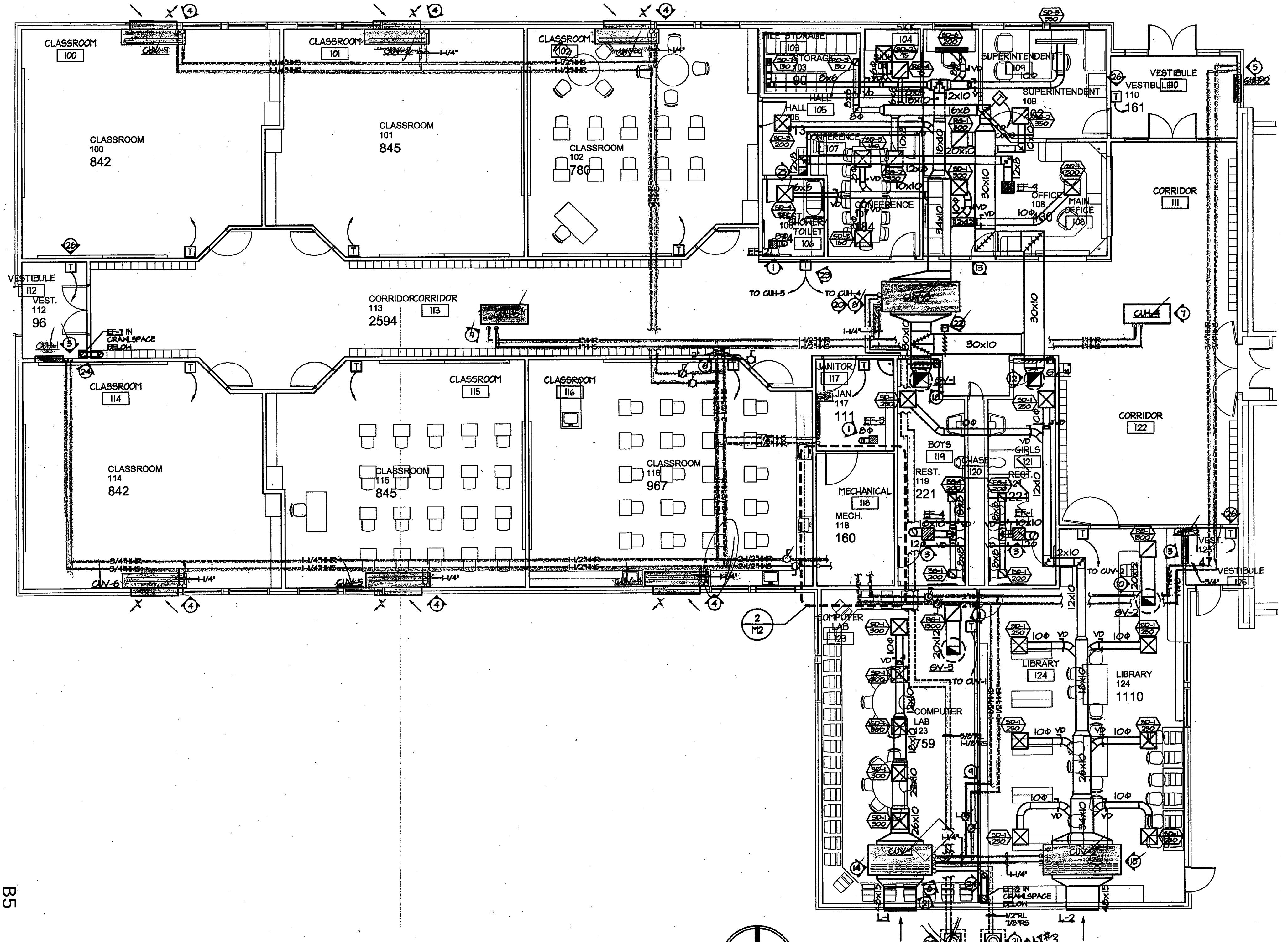


MONTANA
ROBERT W. KNEBEL
7932 E
REGISTERED PROFESSIONAL ENGINEER

Notes:
1) Items labelled pertain to the retrofit of the 1979 Addition and will be installed at a later date. Do not include in the initial retrofit work.
2) Hot water fan coil nominal BTU/hour ratings shown are based on 180° F entering water, 30° F water drop, 70° F entering air, high fan speed, nominal flow rate 3 gal/min.
3) Replace existing pneumatic room thermostats with 24 VAC room thermostats.
Leave pneumatic system intact to operate Gym Heaters and 1979 Addition Electric Fan Coils.
4) Drawing is approximately to scale 1" = 10'.
5) Piping runs on drawing are suggested and for illustration only. Mechanical contractor shall be responsible for selecting the most appropriate piping runs based on the structure of the school.
6) All work performed by the Mechanical Contractor shall meet the requirements and specifications of all applicable mechanical and electrical codes.
7) All copper piping shall be Type M.
8) All piping shall be adequately supported and allowance shall be made for thermal expansion.
9) All piping shall be insulated with 1" wall fiberglass pipe insulation with All Service Jacket. Fittings shall be insulated with pre-formed fiberglass insulation fittings and jackets.
10) Piping to be sweat soldered with Harris Lead-Free Bridgit or equivalent.

GENERAL MECHANICAL SCHEMATIC
REPLACEMENT HEATING SYSTEM
GALLATIN GATEWAY SCHOOL
ROUGH FLOOR PLAN
APPROX. SCALE 1" = 10'
DRAWN 5/16/91 BY RWK

1991 MECHANICAL REMODEL



MECHANICAL PLAN-WEST ADDITION

APPENDIX C

Gallatin Gateway School

Gallatin Gateway, MT

ENERGY MODELING / SAVING CALCULATIONS

Index

Page

Energy Model KWH versus Actual KWH Usage ………………………………………………………………… C1

Energy Model Therms versus Actual Therms ………………………………………………………………. C2

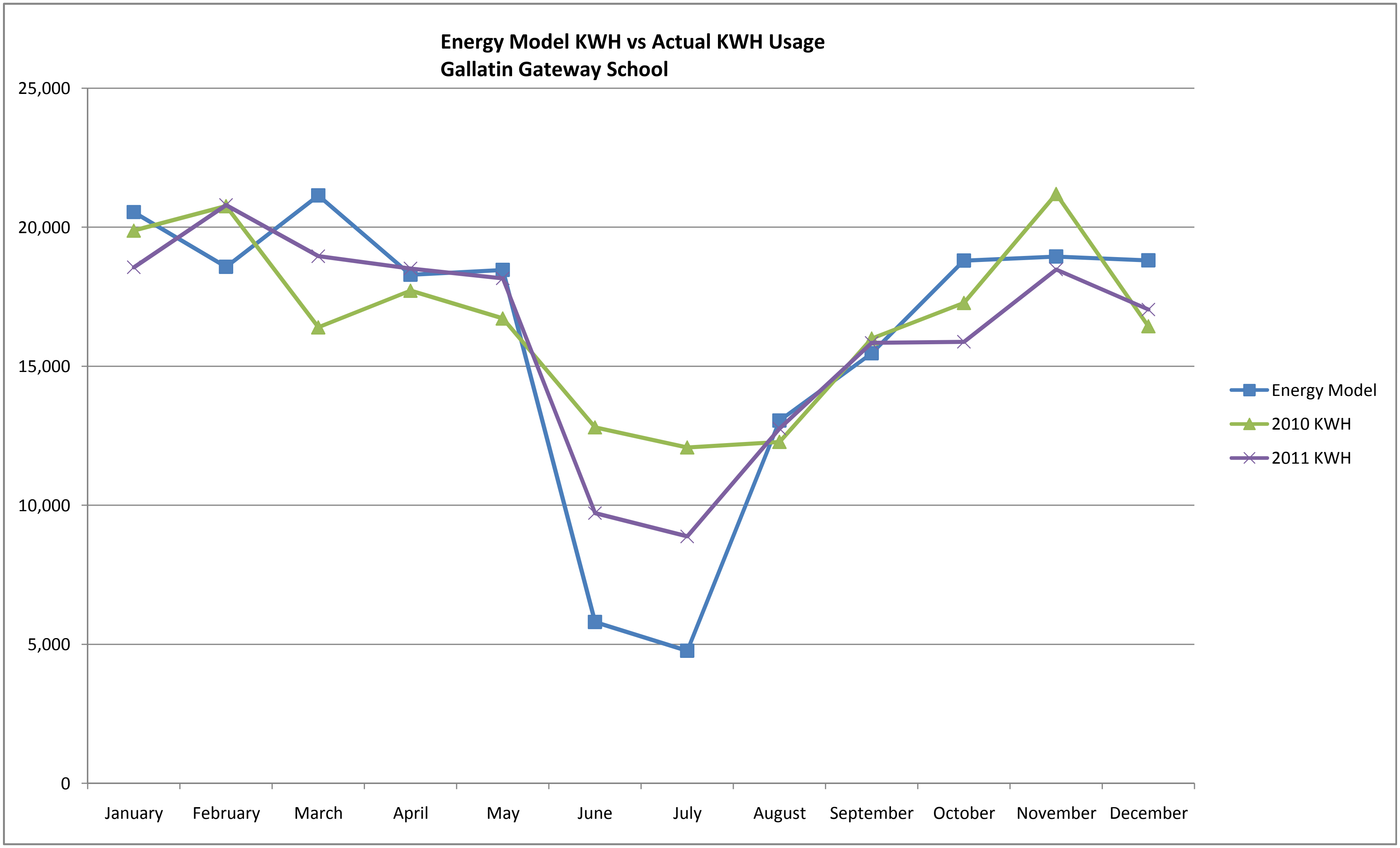
Trace Energy Model Project Information …………………………………………………………………. C3

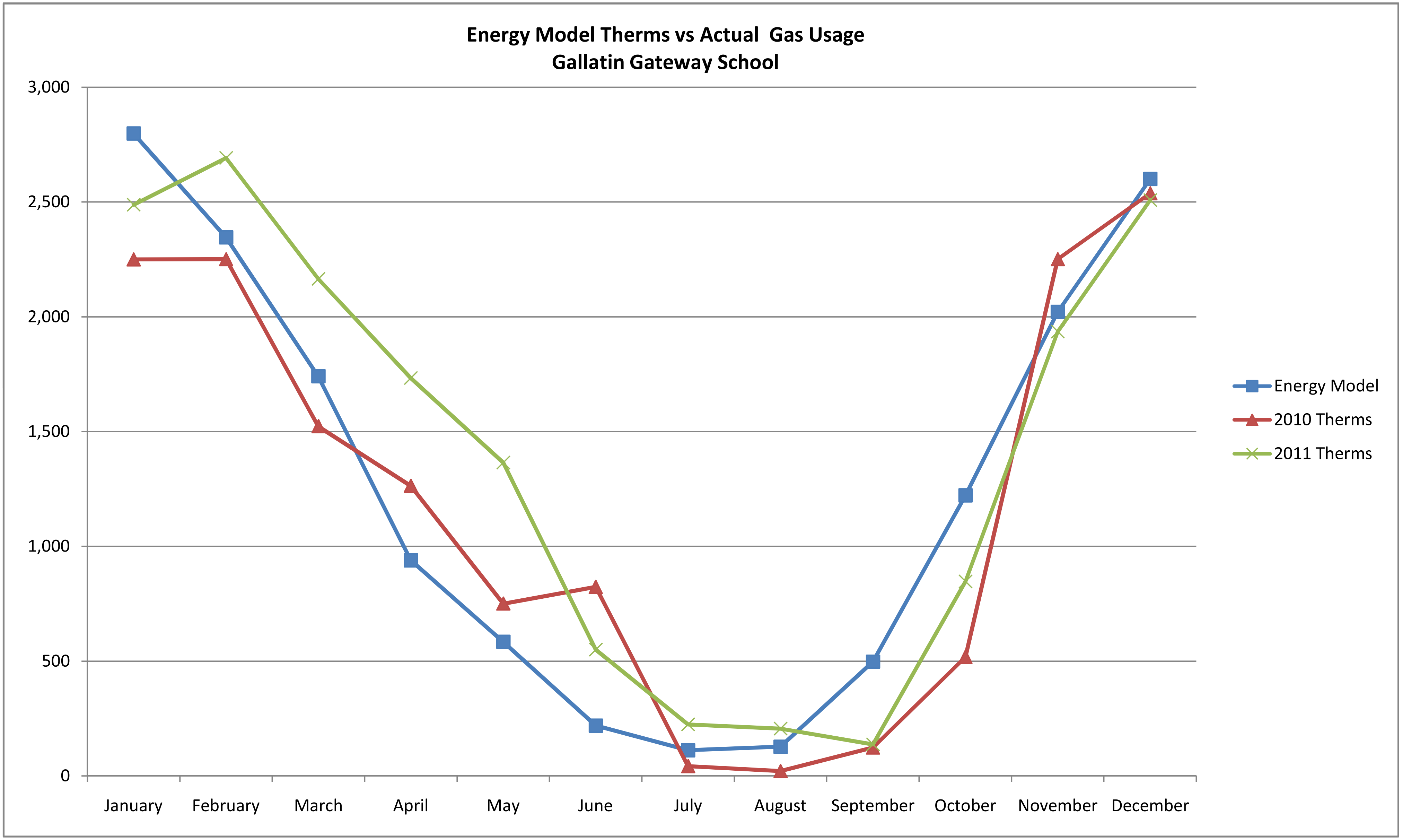
Base Line Energy Consumption Summary …………………………………………………………………. C4

Monthly Energy Consumption (FIM#1-5) ……………………………………………………………… C5-C10

Equipment Energy Consumption (FIM #1-5)…………………………………………………………… C11-C34

Monthly Utility Costs (FIM #1-5) ……………………………………………………………………. C35-C37


Energy Model KWH vs Actual KWH Usage
Gallatin Gateway School
25,000
20,000
15,000
10,000
5,000
0
January
February
March
April
May
June
July
August
September
October
November
December
Energy Model
2010 KWH
2011 KWH


Energy Model Therms vs Actual Gas Usage
Gallatin Gateway School
3,000
2,500
2,000
1,500
1,000
500
0
January
February
March
April
May
June
July
August
September
October
November
December
Energy Model
2010 Therms
2011 Therms

Gallatin Gateway School

Location	**Gallatin Gateway**
Building owner	
Program user	**Matt Carr**
Company	**CTA Architects Engineers**
Comments	

By	**CTA INC.**
Dataset name	**E:\Trane Projects\Projects2\galatingateway\GALGATE-ECMS.TRC**

Calculation time	**12:23 PM on 05/05/2012**
TRACE® 700 version	**6.2.7**

Location	**Bozemanusethis**	
Latitude	**45.8**	**deg**
Longitude	**111.2**	**deg**
Time Zone	**7**	
Elevation	**3,816**	**ft**
Barometric pressure	**26.0**	**in. Hg**
Air density	**0.0659**	**lb/cu ft**
Air specific heat	**0.2444**	**Btu/lb·°F**
Density-specific heat product	**0.9670**	**Btu/h·cfm·°F**
Latent heat factor	**4,256.5**	**Btu·min/h·cu ft**
Enthalpy factor	**3.9559**	**lb·min/hr·cu ft**
Summer design dry bulb	**89**	**°F**
Summer design wet bulb	**62**	**°F**
Winter design dry bulb	**-15**	**°F**
Summer clearness number	**1.00**	
Winter clearness number	**1.00**	
Summer ground reflectance	**0.20**	
Winter ground reflectance	**0.20**	
Carbon Dioxide Level	**400**	**ppm**

Design simulation period	**January - December**
Cooling load methodology	**TETD-TA1**
Heating load methodology	**UATD**

ENERGY CONSUMPTION SUMMARY

By CTA INC.

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1					
Primary heating					
Primary heating		1,177,795	54.1 %	1,177,795	1,239,784
Other Htg Accessories	36,869		5.8 %	125,833	377,536
Heating Subtotal	**36,869**	**1,177,795**	**59.8** %	**1,303,628**	**1,617,320**
Primary cooling					
Cooling Compressor	760		0.1 %	2,596	7,787
Tower/Cond Fans	182		0.0 %	622	1,866
Condenser Pump			0.0 %	0	0
Other Clg Accessories	604		0.1 %	2,062	6,187
Cooling Subtotal....	**1,547**		**0.2** %	**5,280**	**15,840**
Auxiliary					
Supply Fans	22,333		3.5 %	76,222	228,688
Pumps	1,290		0.2 %	4,402	13,208
Stand-alone Base Utilities	11,559	342,884	17.6 %	382,335	479,297
Aux Subtotal....	35,182	342,884	21.3 %	462,959	721,193
Lighting					
Lighting	105,749		16.6 %	360,921	1,082,870
Receptacle					
Receptacles	13,347		2.1 %	45,553	136,673
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**192,693**	**1,520,679**	**100.0** %	**2,178,340**	**3,573,896**

* Note: Resource Utilization factors are included in the Total Source Energy value.

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

Project Name: Gallatin Gateway School
Dataset Name: galgateblrlights.trc

TRACE® 700 v6.2.7 calculated at 07:54 AM on 05/06/2012
Alternative - 1 Energy Consumption Summary report page 1

MONTHLY ENERGY CONSUMPTION

By CTA INC.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Base Case Existing School**												
Electric													
On-Pk Cons. (kWh)	20,548	18,581	21,148	18,293	18,471	5,801	4,768	13,050	15,468	18,806	18,947	18,812	192,693
On-Pk Demand (kW)	63	63	63	63	63	20	19	50	63	63	63	63	63
Gas													
On-Pk Cons. (therms)	2,798	2,346	1,741	939	584	219	112	127	498	1,222	2,021	2,600	15,207
On-Pk Demand (therms/hr)	12	12	9	6	4	2	1	1	4	6	10	10	12

Energy Consumption

Building	66,869	Btu/(ft2-year)
Source	109,709	Btu/(ft2-year)
Floor Area	32,576	ft2

Environmental Impact Analysis

CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By CTA INC.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**FIM #1 Ventilation Upgrade**												
Electric													
On-Pk Cons. (kWh)	20,799	18,905	21,942	19,394	19,750	7,296	5,928	14,001	16,556	19,747	19,346	19,022	202,686
On-Pk Demand (kW)	65	65	65	64	65	22	20	51	64	65	64	65	65
Gas													
On-Pk Cons. (therms)	2,713	2,278	1,668	911	584	220	112	127	484	1,170	1,956	2,507	14,729
On-Pk Demand (therms/hr)	13	12	9	5	4	2	1	1	4	5	9	9	13

Energy Consumption		
Building	66,448	Btu/(ft2-year)
Source	111,305	Btu/(ft2-year)
Floor Area	32,576	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By CTA INC.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 3	**FIM #2 Gym Furnace Replacement**												
Electric													
On-Pk Cons. (kWh)	20,523	18,560	21,141	18,314	18,519	6,015	4,765	13,046	15,564	18,827	18,932	18,788	192,994
On-Pk Demand (kW)	63	63	63	63	63	23	19	50	66	63	63	63	66
Gas													
On-Pk Cons. (therms)	2,584	2,163	1,599	850	553	206	112	127	468	1,105	1,850	2,387	14,003
On-Pk Demand (therms/hr)	12	11	10	7	5	3	1	1	6	7	10	10	12

Energy Consumption

Building	63,205	Btu/(ft2-year)
Source	105,914	Btu/(ft2-year)
Floor Area	32,576	ft2

Environmental Impact Analysis

CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By CTA INC.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 4	**FIM #3 Temperature Control Upgrade**												
Electric													
On-Pk Cons. (kWh)	20,176	18,235	20,722	17,889	18,064	5,538	4,437	12,720	15,067	18,289	18,553	18,437	188,126
On-Pk Demand (kW)	62	62	62	62	62	21	18	50	62	62	62	62	62
Gas													
On-Pk Cons. (therms)	2,337	1,959	1,436	751	535	135	111	127	433	952	1,629	2,105	12,509
On-Pk Demand (therms/hr)	14	14	13	10	8	1	1	1	8	10	12	13	14

Energy Consumption

Building	58,109	Btu/(ft2-year)
Source	99,556	Btu/(ft2-year)
Floor Area	32,576	ft2

Environmental Impact Analysis

CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By CTA INC.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**FIM #4 Boiler Upgrade**												
Electric													
On-Pk Cons. (kWh)	19,063	17,240	19,982	17,539	18,295	5,986	4,829	13,063	15,362	17,932	17,593	17,327	184,210
On-Pk Demand (kW)	61	61	64	64	65	22	19	52	65	65	61	61	65
Gas													
On-Pk Cons. (therms)	2,373	1,968	1,421	744	496	187	111	127	428	961	1,647	2,189	12,653
On-Pk Demand (therms/hr)	10	11	8	6	4	2	1	1	4	6	9	9	11

Energy Consumption

Building	58,143	Btu/(ft2-year)
Source	98,792	Btu/(ft2-year)
Floor Area	32,576	ft2

Environmental Impact Analysis

CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By CTA INC.

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 3	**FIM #5 Occupancy Sensors**												
Electric													
On-Pk Cons. (kWh)	17,088	15,444	17,396	15,179	15,015	5,760	4,743	9,992	13,117	16,199	16,353	16,350	162,634
On-Pk Demand (kW)	57	57	57	57	57	19	18	44	57	57	57	57	57
Gas													
On-Pk Cons. (therms)	2,937	2,468	1,880	1,027	657	221	112	127	527	1,300	2,122	2,699	16,075
On-Pk Demand (therms/hr)	12	12	10	7	5	2	1	1	5	7	10	11	12

Energy Consumption		
Building	66,386	Btu/(ft2-year)
Source	103,067	Btu/(ft2-year)
Floor Area	32,576	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 1 Base Case Existing School

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	10,701.9	9,680.6	11,593.6	10,212.8	11,147.7	2,319.8	2,269.9	10,255.8	9,078.2	9,899.7	9,467.3	9,121.4	105,748.8
Peak (kW)	37.6	37.6	37.6	37.6	37.6	6.7	6.7	37.6	37.6	37.6	37.6	37.6	37.6
Misc. Ld													
Electric (kWh)	1,356.3	1,225.9	1,411.4	1,303.7	1,383.9	523.3	494.5	545.3	1,232.6	1,345.8	1,286.7	1,237.6	13,346.9
Peak (kW)	6.9	6.9	6.9	6.9	6.9	2.1	2.1	2.1	6.9	6.9	6.9	6.9	6.9
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Bsu 1: DHW- Galgate													
Gas (therms)	44.7	40.5	49.0	42.6	46.9	15.8	14.4	16.6	42.6	46.9	44.7	42.6	447.2
Peak (therms/Hr)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Bsu 2: Galgate Kitchen Appliances													
Gas (therms)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (therms/Hr)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Bsu 3: Refrigerated Storage													
Electric (kWh)	891.6	806.7	976.5	849.1	934.0	127.6	116.0	133.4	901.9	992.0	946.9	901.9	8,577.6
Peak (kW)	4.0	4.0	4.0	4.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	4.0	4.0
Bsu 4: Domestic Hot Water (Elec)													
Electric (kWh)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=18.29 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=18.29 tons / 19.11 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	12.6	46.0	83.6	90.3	136.0	207.2	163.4	21.4	0.0	0.0	760.5
Peak (kW)	0.0	0.0	3.4	3.6	3.8	4.2	4.6	4.5	4.2	3.6	0.0	0.0	4.6
Condenser fan for Recip [Design Heat Rejection/F.L.Rate=23.72 tons / 2.25 kW]													
Electric (kWh)	0.0	0.0	2.1	7.4	13.6	13.8	58.4	59.0	24.4	3.5	0.0	0.0	182.2
Peak (kW)	0.0	0.0	0.1	0.2	0.2	0.1	2.3	2.3	0.3	0.2	0.0	0.0	2.3
Cntl panel & interlocks - 0.3 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	12.3	25.2	56.1	101.1	154.2	165.0	79.5	10.8	0.0	0.0	604.2
Peak (kW)	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.3

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 1 Base Case Existing School

	------- Monthly Consumption -------												
Equipment - Utility	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Total**
Hpl 1: Existing Lochinvar Boiler Plant [Sum of dsn coil capacities=394.7 mbh]													
Boiler - 001 [Nominal Capacity/F.L.Rate=750 mbh / 9.38 Therms] (Heating Equipment)													
Gas (therms)	634.8	538.5	346.3	155.0	57.5	8.0	0.2	0.1	39.6	199.9	404.3	557.4	2,941.5
Peak (therms/Hr)	4.9	4.9	4.3	2.9	1.5	0.6	0.0	0.0	1.8	2.9	4.4	4.5	4.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	184.9	167.0	162.6	123.8	75.3	26.4	1.7	0.8	48.2	140.4	173.8	184.9	1,289.8
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	558.0	504.0	490.5	373.5	227.3	79.5	5.3	2.3	145.5	423.8	524.3	558.0	3,891.8
Peak (kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	327.0	249.0	151.5	53.0	3.5	1.5	97.0	282.5	349.5	372.0	2,594.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,625.6	1,237.9	753.2	263.5	17.4	7.5	482.2	1,404.4	1,737.5	1,849.4	12,898.2
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hpl 2: Gas Fired Heat Exchanger Plant [Sum of dsn coil capacities=214.3 mbh]													
Gas-fired heat exchanger - 005 [Nominal Capacity/F.L.Rate=200 mbh / 2.67 Therms] (Heating Equipment)													
Gas (therms)	743.3	630.8	446.3	219.5	85.3	58.0	0.3	0.0	61.4	296.0	539.2	702.3	3,782.3
Peak (therms/Hr)	2.1	2.5	1.7	1.2	1.0	0.8	0.1	0.0	0.9	1.2	1.8	1.9	2.5
Hpl 3: Burnham Boiler Plant [Sum of dsn coil capacities=387.3 mbh]													
Boiler - 003 [Nominal Capacity/F.L.Rate=387.3 mbh / 5.53 Therms] (Heating Equipment)													
Gas (therms)	1,077.2	866.4	572.7	238.0	81.9	31.5	0.8	0.0	70.2	366.7	734.8	1,014.0	5,054.1
Peak (therms/Hr)	3.7	4.0	3.2	2.0	1.7	1.1	0.2	0.0	1.6	2.1	3.0	3.5	4.0
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	347.0	278.0	225.5	146.5	13.5	2.5	149.0	326.0	360.0	372.0	2,928.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,725.1	1,382.0	1,121.0	728.3	67.1	12.4	740.7	1,620.7	1,789.7	1,849.4	14,556.2
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 1 Base Case Existing School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
					------- Monthly Consumption -------								
Sys 1: Fan Coil													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=6,377 cfm / 0.48 kW] (Main Htg Fan)													
Electric (kWh)	221.4	194.9	200.5	170.3	170.7	87.5	90.7	89.8	159.9	185.1	199.5	215.2	1,985.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.1	0.5	0.5	0.5	0.5	0.5
FC Centrifugal const vol [DsnAirflow/F.L.Rate=300 cfm / 0.03 kW] (Room Exhaust Fan)													
Electric (kWh)	0.8	0.6	1.2	0.9	1.0	1.0	1.0	1.0	1.0	0.7	0.6	0.7	10.4
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 2: Unit Ventilator Heating Only													
Unit vent supply fan [DsnAirflow/F.L.Rate=12,995 cfm / 4.04 kW] (Main Clg Fan)													
Electric (kWh)	1,493.2	1,362.4	1,544.1	1,396.3	1,450.4	850.5	952.0	1,154.0	1,537.2	1,467.9	1,435.2	1,465.9	16,109.1
Peak (kW)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
FC Centrifugal const vol [DsnAirflow/F.L.Rate=520 cfm / 0.05 kW] (Room Exhaust Fan)													
Electric (kWh)	7.2	6.4	7.9	7.8	8.9	9.6	11.7	12.7	10.2	7.3	6.7	7.0	103.3
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 3: Unit Heaters													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,840 cfm / 0.14 kW] (Main Htg Fan)													
Electric (kWh)	103.4	93.4	103.4	100.1	103.4	100.1	103.4	103.4	100.1	103.4	100.1	103.4	1,217.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 4: Fin Tubes													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=930 cfm / 0.09 kW] (Room Exhaust Fan)													
Electric (kWh)	10.0	9.0	11.5	9.8	10.8	7.6	7.1	7.9	9.8	10.3	9.8	9.4	112.8
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1
Sys 5: Unit Ventilator with Cooling													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.21 kW] (Main Clg Fan)													
Electric (kWh)	66.6	57.5	64.4	53.6	58.5	10.4	13.4	20.2	49.8	54.8	62.0	70.5	581.6
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sys 6: Gas Fired UH													

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 1 Base Case Existing School

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
					------- Monthly Consumption -------								
Sys 6: Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=876.5 cfm / 0.07 kW] (Main Htg Fan)													
Electric (kWh)	27.5	24.3	25.9	22.2	22.6	11.0	10.7	10.7	21.1	23.8	25.0	26.7	251.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Sys 7: Unit Heaters Old Bldg													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=2,250 cfm / 0.17 kW] (Main Htg Fan)													
Electric (kWh)	126.4	114.2	126.4	122.4	126.4	122.4	126.4	126.4	122.4	126.4	122.4	126.4	1,488.7
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sys 8: Gym Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.11 kW] (Main Htg Fan)													
Electric (kWh)	57.6	51.9	49.5	37.5	33.5	21.9	18.1	20.9	30.1	43.5	51.7	56.4	472.5
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 2 FIM #1 Ventilation Upgrade

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Consumption -------												
Lights													
Electric (kWh)	10,701.9	9,680.6	11,593.6	10,212.8	11,147.7	2,319.8	2,269.9	10,255.8	9,078.2	9,899.7	9,467.3	9,121.4	105,748.8
Peak (kW)	37.6	37.6	37.6	37.6	37.6	6.7	6.7	37.6	37.6	37.6	37.6	37.6	37.6
Misc. Ld													
Electric (kWh)	1,356.3	1,225.9	1,411.4	1,303.7	1,383.9	523.3	494.5	545.3	1,232.6	1,345.8	1,286.7	1,237.6	13,346.9
Peak (kW)	6.9	6.9	6.9	6.9	6.9	2.1	2.1	2.1	6.9	6.9	6.9	6.9	6.9
Energy Recovery Parasitics													
Electric (kWh)	201.6	182.4	220.8	192.0	211.2	211.2	120.0	0.0	192.0	211.2	201.6	192.0	2,136.0
Peak (kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.0	1.2	1.2	1.2	1.2	1.2
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Bsu 1: DHW- Galgate													
Gas (therms)	44.7	40.5	49.0	42.6	46.9	15.8	14.4	16.6	42.6	46.9	44.7	42.6	447.2
Peak (therms/Hr)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Bsu 2: Galgate Kitchen Appliances													
Gas (therms)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (therms/Hr)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Bsu 3: Refrigerated Storage													
Electric (kWh)	891.6	806.7	976.5	849.1	934.0	127.6	116.0	133.4	901.9	992.0	946.9	901.9	8,577.6
Peak (kW)	4.0	4.0	4.0	4.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	4.0	4.0
Bsu 4: Domestic Hot Water (Elec)													
Electric (kWh)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=17.86 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=17.86 tons / 18.67 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	12.6	46.0	83.6	90.3	136.0	207.2	163.4	21.4	0.0	0.0	760.5
Peak (kW)	0.0	0.0	3.4	3.5	3.7	4.1	4.5	4.4	4.1	3.5	0.0	0.0	4.5
Condenser fan for Recip [Design Heat Rejection/F.L.Rate=23.17 tons / 2.20 kW]													
Electric (kWh)	0.0	0.0	2.1	7.4	13.6	13.8	57.5	58.3	24.4	3.5	0.0	0.0	180.6
Peak (kW)	0.0	0.0	0.1	0.2	0.2	0.1	2.2	2.2	0.3	0.2	0.0	0.0	2.2

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 2 FIM #1 Ventilation Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=17.86 tons]													
Cntl panel & interlocks - 0.3 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	12.3	25.2	56.1	101.1	154.2	165.0	79.5	10.8	0.0	0.0	604.2
Peak (kW)	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.3
Hpl 1: Existing Lochinvar Boiler Plant [Sum of dsn coil capacities=381.5 mbh]													
Boiler - 001 [Nominal Capacity/F.L.Rate=750 mbh / 9.38 Therms] (Heating Equipment)													
Gas (therms)	480.1	410.2	251.0	118.1	47.0	8.0	0.1	0.1	28.5	140.4	296.0	412.0	2,191.5
Peak (therms/Hr)	4.3	4.0	3.0	1.7	1.0	0.4	0.1	0.0	0.9	1.5	2.9	3.3	4.3
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	184.9	167.0	165.3	127.0	83.0	33.8	0.5	0.5	52.7	143.2	174.2	184.9	1,317.2
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	558.0	504.0	498.8	383.3	250.5	102.0	1.5	1.5	159.0	432.0	525.8	558.0	3,974.3
Peak (kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	332.5	255.5	167.0	68.0	1.0	1.0	106.0	288.0	350.5	372.0	2,649.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,653.0	1,270.2	830.2	338.1	5.0	5.0	527.0	1,431.8	1,742.5	1,849.4	13,171.7
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hpl 2: Gas Fired Heat Exchanger Plant [Sum of dsn coil capacities=216.0 mbh]													
Gas-fired heat exchanger - 005 [Nominal Capacity/F.L.Rate=200 mbh / 2.67 Therms] (Heating Equipment)													
Gas (therms)	731.2	621.1	434.3	215.0	82.6	55.2	0.1	0.0	60.2	293.1	534.9	692.9	3,720.6
Peak (therms/Hr)	2.1	2.5	1.6	1.2	0.9	0.7	0.0	0.0	0.9	1.2	1.8	1.8	2.5
Hpl 3: Burnham Boiler Plant [Sum of dsn coil capacities=445.7 mbh]													
Boiler - 003 [Nominal Capacity/F.L.Rate=445.7 mbh / 6.37 Therms] (Heating Equipment)													
Gas (therms)	1,085.1	873.7	558.6	224.7	77.9	32.1	0.8	0.0	60.9	345.3	731.0	1,011.6	5,001.8
Peak (therms/Hr)	3.6	4.0	3.1	2.0	1.6	0.9	0.2	0.0	1.5	2.0	3.1	3.5	4.0

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 2 FIM #1 Ventilation Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Hpl 3: Burnham Boiler Plant [Sum of dsn coil capacities=445.7 mbh]													
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	348.5	285.5	239.0	153.0	13.5	2.5	156.5	330.0	359.5	372.0	2,968.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,732.5	1,419.3	1,188.2	760.6	67.1	12.4	778.0	1,640.6	1,787.2	1,849.4	14,755.0
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hpl 4: Kitchen MakeUP Unit [Sum of dsn coil capacities=114.8 mbh]													
Gas-fired heat exchanger - 007 [Nominal Capacity/F.L.Rate=114.8 mbh / 1.16 Therms] (Heating Equipment)													
Gas (therms)	73.8	62.3	48.7	26.6	17.2	2.8	0.1	0.0	7.7	31.7	51.4	63.4	385.9
Peak (therms/Hr)	1.2	1.2	0.9	0.6	0.5	0.1	0.0	0.0	0.3	0.6	1.0	1.0	1.2
Cntl panel & interlocks - 0.05 KW (Misc Accessory Equipment)													
Electric (kWh)	15.0	13.5	13.9	11.9	9.0	6.2	0.8	0.3	5.8	12.8	14.2	15.1	118.1
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 1: Fan Coils1													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=5,875 cfm / 0.44 kW] (Main Htg Fan)													
Electric (kWh)	88.6	71.7	46.6	19.3	6.4	3.0	0.1	0.0	5.4	29.8	61.3	83.7	415.9
Peak (kW)	0.3	0.3	0.2	0.2	0.1	0.1	0.0	0.0	0.1	0.2	0.3	0.3	0.3
BI Centrifugal const vol [DsnAirflow/F.L.Rate=300 cfm / 0.02 kW] (Room Exhaust Fan)													
Electric (kWh)	0.6	0.5	0.9	0.7	0.8	0.7	0.8	0.7	0.7	0.5	0.5	0.5	7.8
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BI Centrifugal const vol [DsnAirflow/F.L.Rate=800 cfm / 0.21 kW] (Opt. Ventilation Fan)													
Electric (kWh)	35.8	32.4	39.3	34.1	37.6	26.4	15.0	0.0	34.1	37.6	35.8	34.1	362.3
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.2	0.2	0.2	0.2	0.2
Sys 10: North Unit Vents													
Unit vent supply fan [DsnAirflow/F.L.Rate=6,500 cfm / 2.02 kW] (Main Clg Fan)													
Electric (kWh)	687.0	727.9	1,190.2	1,415.1	1,503.6	1,453.7	1,504.5	1,504.5	1,456.0	1,294.3	811.9	649.6	14,198.4
Peak (kW)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 2 FIM #1 Ventilation Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 10: North Unit Vents													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=400 cfm / 0.08 kW] (Room Exhaust Fan)													
Electric (kWh)	4.1	3.6	5.6	4.5	4.9	3.4	3.2	2.6	4.6	4.1	3.7	3.8	48.1
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BI Centrifugal const vol [DsnAirflow/F.L.Rate=931.3 cfm / 0.32 kW] (Opt. Ventilation Fan)													
Electric (kWh)	54.2	49.1	59.4	51.7	56.8	18.9	10.8	0.0	51.7	56.8	54.2	51.7	515.3
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.0	0.3	0.3	0.3	0.3	0.3
Sys 2: Unit Ventilator Heating Only													
Unit vent supply fan [DsnAirflow/F.L.Rate=6,495 cfm / 2.02 kW] (Main Clg Fan)													
Electric (kWh)	826.4	752.4	855.4	795.6	815.1	539.1	567.2	703.1	875.3	825.2	792.7	810.4	9,157.8
Peak (kW)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Sys 3: Unit Heaters													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,840 cfm / 0.14 kW] (Main Htg Fan)													
Electric (kWh)	103.4	93.4	103.4	100.1	103.4	100.1	103.4	103.4	100.1	103.4	100.1	103.4	1,217.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 5: Unit Ventilator with Cooling													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.21 kW] (Main Clg Fan)													
Electric (kWh)	66.6	57.5	64.4	53.6	58.5	10.4	13.4	20.2	49.8	54.8	62.0	70.5	581.6
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sys 6: Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=909.7 cfm / 0.07 kW] (Main Htg Fan)													
Electric (kWh)	25.0	22.1	23.4	20.3	20.9	7.9	7.8	7.8	19.5	22.1	23.2	24.3	224.1
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
BI Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.20 kW] (Opt. Ventilation Fan)													
Electric (kWh)	20.9	18.9	22.3	20.0	21.6	7.5	7.6	7.7	20.0	21.6	20.7	20.3	209.2
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2
Sys 7: Unit Heaters Old Bldg													

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 2 FIM #1 Ventilation Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 7: Unit Heaters Old Bldg													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=2,250 cfm / 0.17 kW] (Main Htg Fan)													
Electric (kWh)	126.4	114.2	126.4	122.4	126.4	122.4	126.4	126.4	122.4	126.4	122.4	126.4	1,488.7
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sys 8: Gym Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.11 kW] (Main Htg Fan)													
Electric (kWh)	57.6	51.9	49.5	37.5	33.5	21.9	18.1	20.9	30.1	43.5	51.7	56.4	472.5
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 9: Fan Coils2													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=734.0 cfm / 0.06 kW] (Main Htg Fan)													
Electric (kWh)	4.9	4.1	3.0	1.5	1.1	0.3	0.0	0.0	0.4	1.8	3.4	4.4	24.8
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BI Centrifugal const vol [DsnAirflow/F.L.Rate=800 cfm / 0.06 kW] (Room Exhaust Fan)													
Electric (kWh)	11.6	10.5	12.8	11.1	12.2	7.5	6.0	5.2	11.1	12.1	11.6	11.0	122.5
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
BI Centrifugal const vol [DsnAirflow/F.L.Rate=800 cfm / 0.21 kW] (Opt. Ventilation Fan)													
Electric (kWh)	35.8	32.4	39.3	34.1	37.6	18.8	10.7	0.0	34.1	37.6	35.8	34.1	350.3
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.2	0.2	0.2	0.2	0.2

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 3 FIM #2 Gym Furnace Replacement

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	10,701.9	9,680.6	11,593.6	10,212.8	11,147.7	2,319.8	2,269.9	10,255.8	9,078.2	9,899.7	9,467.3	9,121.4	105,748.8
Peak (kW)	37.6	37.6	37.6	37.6	37.6	6.7	6.7	37.6	37.6	37.6	37.6	37.6	37.6
Misc. Ld													
Electric (kWh)	1,356.3	1,225.9	1,411.4	1,303.7	1,383.9	523.3	494.5	545.3	1,232.6	1,345.8	1,286.7	1,237.6	13,346.9
Peak (kW)	6.9	6.9	6.9	6.9	6.9	2.1	2.1	2.1	6.9	6.9	6.9	6.9	6.9
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Bsu 1: DHW- Galgate													
Gas (therms)	44.7	40.5	49.0	42.6	46.9	15.8	14.4	16.6	42.6	46.9	44.7	42.6	447.2
Peak (therms/Hr)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Bsu 2: Galgate Kitchen Appliances													
Gas (therms)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (therms/Hr)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Bsu 3: Refrigerated Storage													
Electric (kWh)	891.6	806.7	976.5	849.1	934.0	127.6	116.0	133.4	901.9	992.0	946.9	901.9	8,577.6
Peak (kW)	4.0	4.0	4.0	4.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	4.0	4.0
Bsu 4: Domestic Hot Water (Elec)													
Electric (kWh)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=18.29 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=18.29 tons / 19.11 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	12.6	46.0	83.6	90.3	136.0	207.2	163.4	21.4	0.0	0.0	760.5
Peak (kW)	0.0	0.0	3.4	3.6	3.8	4.2	4.6	4.5	4.2	3.6	0.0	0.0	4.6
Condenser fan for Recip [Design Heat Rejection/F.L.Rate=23.72 tons / 2.25 kW]													
Electric (kWh)	0.0	0.0	2.1	7.4	13.6	13.8	58.4	59.0	24.4	3.5	0.0	0.0	182.2
Peak (kW)	0.0	0.0	0.1	0.2	0.2	0.1	2.3	2.3	0.3	0.2	0.0	0.0	2.3
Cntl panel & interlocks - 0.3 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	12.3	25.2	56.1	101.1	154.2	165.0	79.5	10.8	0.0	0.0	604.2
Peak (kW)	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.3

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 3 FIM #2 Gym Furnace Replacement

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Hpl 1: Existing Lochinvar Boiler Plant [Sum of dsn coil capacities=543.9 mbh]													
Boiler - 001 [Nominal Capacity/F.L.Rate=750 mbh / 9.38 Therms] (Heating Equipment)													
Gas (therms)	1,136.6	970.4	655.3	296.6	119.5	49.4	0.2	0.1	80.1	401.6	772.4	1,024.4	5,506.6
Peak (therms/Hr)	6.7	6.8	6.1	4.7	3.3	2.3	0.0	0.0	3.7	4.8	6.3	6.4	6.8
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	184.9	167.0	164.1	126.0	78.8	39.8	1.7	0.8	54.4	144.2	174.5	184.9	1,321.1
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	558.0	504.0	495.0	380.3	237.8	120.0	5.3	2.3	164.3	435.0	526.5	558.0	3,986.3
Peak (kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	330.0	253.5	158.5	80.0	3.5	1.5	109.5	290.0	351.0	372.0	2,657.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,640.6	1,260.2	788.0	397.7	17.4	7.5	544.4	1,441.7	1,745.0	1,849.4	13,211.4
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hpl 2: Gas Fired Heat Exchanger Plant [Sum of dsn coil capacities=46.61 mbh]													
Gas-fired heat exchanger - 005 [Nominal Capacity/F.L.Rate=200 mbh / 2.67 Therms] (Heating Equipment)													
Gas (therms)	79.9	61.7	43.7	19.7	8.0	6.9	0.3	0.0	4.7	22.1	49.3	74.3	370.5
Peak (therms/Hr)	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.0	0.2	0.2	0.3	0.4	0.4
Hpl 3: Burnham Boiler Plant [Sum of dsn coil capacities=386.2 mbh]													
Boiler - 003 [Nominal Capacity/F.L.Rate=386.2 mbh / 5.52 Therms] (Heating Equipment)													
Gas (therms)	1,024.3	820.2	524.6	206.7	66.6	28.5	0.8	0.0	56.5	321.6	685.1	962.0	4,696.9
Peak (therms/Hr)	3.6	3.9	3.1	2.0	1.6	0.9	0.2	0.0	1.5	2.0	2.9	3.5	3.9
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	345.0	277.5	225.5	147.0	13.5	2.5	149.5	322.0	359.0	372.0	2,921.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,715.1	1,379.6	1,121.0	730.8	67.1	12.4	743.2	1,600.8	1,784.7	1,849.4	14,523.9
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 3 FIM #2 Gym Furnace Replacement

					------- Monthly Consumption -------								
Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 1: Fan Coil													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=6,377 cfm / 0.48 kW] (Main Htg Fan)													
Electric (kWh)	216.9	190.9	196.9	168.1	169.9	87.4	90.7	89.8	159.2	181.9	195.5	210.7	1,957.9
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.1	0.5	0.5	0.5	0.5	0.5
FC Centrifugal const vol [DsnAirflow/F.L.Rate=300 cfm / 0.03 kW] (Room Exhaust Fan)													
Electric (kWh)	0.8	0.6	1.2	0.9	1.0	1.0	1.0	1.0	1.0	0.7	0.6	0.7	10.4
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 2: Unit Ventilator Heating Only													
Unit vent supply fan [DsnAirflow/F.L.Rate=12,995 cfm / 4.04 kW] (Main Clg Fan)													
Electric (kWh)	1,493.2	1,362.4	1,544.1	1,396.3	1,450.4	850.5	952.0	1,154.0	1,537.2	1,467.9	1,435.2	1,465.9	16,109.1
Peak (kW)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
FC Centrifugal const vol [DsnAirflow/F.L.Rate=520 cfm / 0.05 kW] (Room Exhaust Fan)													
Electric (kWh)	7.2	6.4	7.9	7.8	8.9	9.6	11.7	12.7	10.2	7.3	6.7	7.0	103.3
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 3: Unit Heaters													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,840 cfm / 0.14 kW] (Main Htg Fan)													
Electric (kWh)	103.4	93.4	103.4	100.1	103.4	100.1	103.4	103.4	100.1	103.4	100.1	103.4	1,217.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 4: Fin Tubes													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=930 cfm / 0.09 kW] (Room Exhaust Fan)													
Electric (kWh)	4.6	4.1	5.6	4.7	5.1	3.9	3.7	4.0	4.7	4.7	4.4	4.3	53.8
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 5: Unit Ventilator with Cooling													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.21 kW] (Main Clg Fan)													
Electric (kWh)	66.6	57.5	64.4	53.6	58.5	10.4	13.4	20.2	49.8	54.8	62.0	70.5	581.6
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sys 6: Gas Fired UH													

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 3 FIM #2 Gym Furnace Replacement

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
					------- Monthly Consumption -------								
Sys 6: Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=876.5 cfm / 0.07 kW] (Main Htg Fan)													
Electric (kWh)	27.5	24.3	25.9	22.2	22.6	11.0	10.7	10.7	21.1	23.8	25.0	26.7	251.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Sys 7: Unit Heaters Old Bldg													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=2,250 cfm / 0.17 kW] (Main Htg Fan)													
Electric (kWh)	126.4	114.2	126.4	122.4	126.4	122.4	126.4	126.4	122.4	126.4	122.4	126.4	1,488.7
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sys 8: Gym Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.11 kW] (Main Htg Fan)													
Electric (kWh)	43.1	39.6	41.0	32.8	32.4	21.6	18.1	20.9	28.9	37.0	39.9	41.7	396.8
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 4 FIM #3 Temperature Control Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	10,701.9	9,680.6	11,593.6	10,212.8	11,147.7	2,319.8	2,269.9	10,255.8	9,078.2	9,899.7	9,467.3	9,121.4	105,748.8
Peak (kW)	37.6	37.6	37.6	37.6	37.6	6.7	6.7	37.6	37.6	37.6	37.6	37.6	37.6
Misc. Ld													
Electric (kWh)	1,356.3	1,225.9	1,411.4	1,303.7	1,383.9	523.3	494.5	545.3	1,232.6	1,345.8	1,286.7	1,237.6	13,346.9
Peak (kW)	6.9	6.9	6.9	6.9	6.9	2.1	2.1	2.1	6.9	6.9	6.9	6.9	6.9
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Bsu 1: DHW- Galgate													
Gas (therms)	44.7	40.5	49.0	42.6	46.9	15.8	14.4	16.6	42.6	46.9	44.7	42.6	447.2
Peak (therms/Hr)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Bsu 2: Galgate Kitchen Appliances													
Gas (therms)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (therms/Hr)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Bsu 3: Refrigerated Storage													
Electric (kWh)	891.6	806.7	976.5	849.1	934.0	127.6	116.0	133.4	901.9	992.0	946.9	901.9	8,577.6
Peak (kW)	4.0	4.0	4.0	4.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	4.0	4.0
Bsu 4: Domestic Hot Water (Elec)													
Electric (kWh)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=18.29 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=18.29 tons / 19.11 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	12.6	46.0	83.6	90.3	136.0	207.2	163.4	21.4	0.0	0.0	760.5
Peak (kW)	0.0	0.0	3.4	3.6	3.8	4.2	4.6	4.5	4.2	3.6	0.0	0.0	4.6
Condenser fan for Recip [Design Heat Rejection/F.L.Rate=23.72 tons / 2.25 kW]													
Electric (kWh)	0.0	0.0	2.1	7.4	13.6	13.8	58.4	59.0	24.4	3.5	0.0	0.0	182.2
Peak (kW)	0.0	0.0	0.1	0.2	0.2	0.1	2.3	2.3	0.3	0.2	0.0	0.0	2.3
Cntl panel & interlocks - 0.3 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	12.3	25.2	56.1	101.1	154.2	165.0	79.5	10.8	0.0	0.0	604.2
Peak (kW)	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.3

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 4 FIM #3 Temperature Control Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Hpl 1: Existing Lochinvar Boiler Plant [Sum of dsn coil capacities=394.7 mbh]													
Boiler - 001 [Nominal Capacity/F.L.Rate=750 mbh / 9.38 Therms] (Heating Equipment)													
Gas (therms)	634.8	538.5	346.3	155.0	57.5	8.0	0.2	0.1	39.6	199.9	404.3	557.4	2,941.5
Peak (therms/Hr)	4.9	4.9	4.3	2.9	1.5	0.6	0.0	0.0	1.8	2.9	4.4	4.5	4.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	184.9	167.0	162.6	123.8	75.3	26.4	1.7	0.8	48.2	140.4	173.8	184.9	1,289.8
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	558.0	504.0	490.5	373.5	227.3	79.5	5.3	2.3	145.5	423.8	524.3	558.0	3,891.8
Peak (kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	327.0	249.0	151.5	53.0	3.5	1.5	97.0	282.5	349.5	372.0	2,594.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,625.6	1,237.9	753.2	263.5	17.4	7.5	482.2	1,404.4	1,737.5	1,849.4	12,898.2
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hpl 2: Gas Fired Heat Exchanger Plant [Sum of dsn coil capacities=214.3 mbh]													
Gas-fired heat exchanger - 005 [Nominal Capacity/F.L.Rate=200 mbh / 2.67 Therms] (Heating Equipment)													
Gas (therms)	585.7	497.9	357.4	158.5	76.1	0.0	0.0	0.0	38.4	215.2	410.4	525.3	2,865.0
Peak (therms/Hr)	2.7	2.7	2.7	2.7	2.7	0.0	0.0	0.0	2.7	2.7	2.7	2.7	2.7
Hpl 3: Burnham Boiler Plant [Sum of dsn coil capacities=387.3 mbh]													
Boiler - 003 [Nominal Capacity/F.L.Rate=387.3 mbh / 5.53 Therms] (Heating Equipment)													
Gas (therms)	773.1	612.5	356.3	111.0	41.7	5.7	0.1	0.0	28.6	177.9	471.3	695.5	3,273.7
Peak (therms/Hr)	4.8	4.6	4.4	3.3	2.4	0.2	0.0	0.0	2.4	3.3	4.0	4.4	4.8
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	335.5	344.0	277.0	226.5	155.5	13.5	2.5	148.5	309.0	358.5	371.5	2,914.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,667.9	1,710.2	1,377.1	1,126.0	773.0	67.1	12.4	738.2	1,536.2	1,782.2	1,846.9	14,486.6
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 4 FIM #3 Temperature Control Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 1: Fan Coil													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=6,377 cfm / 0.48 kW] (Main Htg Fan)													
Electric (kWh)	57.9	45.8	27.1	8.7	3.5	0.1	0.0	0.0	2.3	13.7	35.2	51.6	245.8
Peak (kW)	0.4	0.4	0.4	0.3	0.2	0.0	0.0	0.0	0.2	0.3	0.4	0.4	0.4
FC Centrifugal const vol [DsnAirflow/F.L.Rate=300 cfm / 0.03 kW] (Room Exhaust Fan)													
Electric (kWh)	0.8	0.6	1.2	0.9	1.0	1.0	1.0	1.0	1.0	0.7	0.6	0.7	10.4
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 2: Unit Ventilator Heating Only													
Unit vent supply fan [DsnAirflow/F.L.Rate=12,995 cfm / 4.04 kW] (Main Clg Fan)													
Electric (kWh)	1,493.2	1,362.4	1,544.1	1,396.3	1,450.4	850.5	952.0	1,154.0	1,537.2	1,467.9	1,435.2	1,465.9	16,109.1
Peak (kW)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
FC Centrifugal const vol [DsnAirflow/F.L.Rate=520 cfm / 0.05 kW] (Room Exhaust Fan)													
Electric (kWh)	7.2	6.4	7.9	7.8	8.9	9.6	11.7	12.7	10.2	7.3	6.7	7.0	103.3
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 3: Unit Heaters													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,840 cfm / 0.14 kW] (Main Htg Fan)													
Electric (kWh)	22.9	17.9	11.7	5.2	2.8	1.8	0.3	0.0	2.0	7.1	14.7	21.6	107.9
Peak (kW)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Sys 4: Fin Tubes													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=930 cfm / 0.09 kW] (Room Exhaust Fan)													
Electric (kWh)	10.0	9.0	11.5	9.8	10.8	7.6	7.1	7.9	9.8	10.3	9.8	9.4	112.8
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1
Sys 5: Unit Ventilator with Cooling													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.21 kW] (Main Clg Fan)													
Electric (kWh)	66.6	57.5	64.4	53.6	58.5	10.4	13.4	20.2	49.8	54.8	62.0	70.5	581.6
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sys 6: Gas Fired UH													

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 4 FIM #3 Temperature Control Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 6: Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=876.5 cfm / 0.07 kW] (Main Htg Fan)													
Electric (kWh)	5.6	4.3	2.9	1.0	0.5	0.0	0.0	0.0	0.2	1.1	3.2	4.9	23.6
Peak (kW)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Sys 7: Unit Heaters Old Bldg													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=2,250 cfm / 0.17 kW] (Main Htg Fan)													
Electric (kWh)	41.0	32.6	20.9	10.2	6.1	4.4	0.2	0.0	3.3	11.6	25.9	40.1	196.2
Peak (kW)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2
Sys 8: Gym Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.11 kW] (Main Htg Fan)													
Electric (kWh)	37.7	34.5	35.3	29.2	30.3	19.9	18.1	20.9	27.7	32.4	35.2	37.6	358.7
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 2 FIM #4 Boiler Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	10,701.9	9,680.6	11,593.6	10,212.8	11,147.7	2,319.8	2,269.9	10,255.8	9,078.2	9,899.7	9,467.3	9,121.4	105,748.8
Peak (kW)	37.6	37.6	37.6	37.6	37.6	6.7	6.7	37.6	37.6	37.6	37.6	37.6	37.6
Misc. Ld													
Electric (kWh)	1,356.3	1,225.9	1,411.4	1,303.7	1,383.9	523.3	494.5	545.3	1,232.6	1,345.8	1,286.7	1,237.6	13,346.9
Peak (kW)	6.9	6.9	6.9	6.9	6.9	2.1	2.1	2.1	6.9	6.9	6.9	6.9	6.9
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Bsu 1: DHW- Galgate													
Gas (therms)	44.7	40.5	49.0	42.6	46.9	15.8	14.4	16.6	42.6	46.9	44.7	42.6	447.2
Peak (therms/Hr)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Bsu 2: Galgate Kitchen Appliances													
Gas (therms)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (therms/Hr)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Bsu 3: Refrigerated Storage													
Electric (kWh)	891.6	806.7	976.5	849.1	934.0	127.6	116.0	133.4	901.9	992.0	946.9	901.9	8,577.6
Peak (kW)	4.0	4.0	4.0	4.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	4.0	4.0
Bsu 4: Domestic Hot Water (Elec)													
Electric (kWh)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=18.29 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=18.29 tons / 19.11 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	12.6	46.0	83.6	90.3	136.0	207.2	163.4	21.4	0.0	0.0	760.5
Peak (kW)	0.0	0.0	3.4	3.6	3.8	4.2	4.6	4.5	4.2	3.6	0.0	0.0	4.6
Condenser fan for Recip [Design Heat Rejection/F.L.Rate=23.72 tons / 2.25 kW]													
Electric (kWh)	0.0	0.0	2.1	7.4	13.6	13.8	58.4	59.0	24.4	3.5	0.0	0.0	182.2
Peak (kW)	0.0	0.0	0.1	0.2	0.2	0.1	2.3	2.3	0.3	0.2	0.0	0.0	2.3
Cntl panel & interlocks - 0.3 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	12.3	25.2	56.1	101.1	154.2	165.0	79.5	10.8	0.0	0.0	604.2
Peak (kW)	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.3

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 2 FIM #4 Boiler Upgrade

Equipment - Utility					------- Monthly Consumption -------								Total
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
Hpl 1: Gas Fired Heat Exchanger Plant [Sum of dsn coil capacities=214.3 mbh]													
Gas-fired heat exchanger - 005 [Nominal Capacity/F.L.Rate=200 mbh / 2.67 Therms] (Heating Equipment)													
Gas (therms)	743.3	630.8	446.3	219.5	85.3	58.0	0.3	0.0	61.4	296.0	539.2	702.3	3,782.3
Peak (therms/Hr)	2.1	2.5	1.7	1.2	1.0	0.8	0.1	0.0	0.9	1.2	1.8	1.9	2.5
Hpl 2: Condensing Boiler Plant [Sum of dsn coil capacities=782.0 mbh]													
Boiler - 003 [Nominal Capacity/F.L.Rate=1,400 mbh / 15.05 Therms] (Heating Equipment)													
Gas (therms)	1,286.7	1,027.4	599.6	197.5	51.9	7.7	0.0	0.0	40.3	306.0	764.9	1,160.4	5,442.3
Peak (therms/Hr)	6.8	7.0	5.7	3.5	2.3	1.0	0.0	0.0	2.3	3.6	5.7	5.9	7.0
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	1,479.5	1,336.3	1,403.9	1,155.3	950.5	592.6	67.6	15.9	622.4	1,328.3	1,431.7	1,479.5	11,863.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	353.0	290.5	239.0	149.0	17.0	4.0	156.5	334.0	360.0	372.0	2,983.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,754.9	1,444.2	1,188.2	740.7	84.5	19.9	778.0	1,660.4	1,789.7	1,849.4	14,829.6
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Sys 1: Fan Coil													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=6,377 cfm / 0.48 kW] (Main Htg Fan)													
Electric (kWh)	221.4	194.9	200.5	170.3	170.7	87.5	90.7	89.8	159.9	185.1	199.5	215.2	1,985.5
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.1	0.5	0.5	0.5	0.5	0.5
FC Centrifugal const vol [DsnAirflow/F.L.Rate=300 cfm / 0.03 kW] (Room Exhaust Fan)													
Electric (kWh)	0.8	0.6	1.2	0.9	1.0	1.0	1.0	1.0	1.0	0.7	0.6	0.7	10.4
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 2: Unit Ventilator Heating Only													
Unit vent supply fan [DsnAirflow/F.L.Rate=12,995 cfm / 4.04 kW] (Main Clg Fan)													
Electric (kWh)	1,493.2	1,362.4	1,544.1	1,396.3	1,450.4	850.5	952.0	1,154.0	1,537.2	1,467.9	1,435.2	1,465.9	16,109.1
Peak (kW)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

EQUIPMENT ENERGY CONSUMPTION
By CTA INC.

Alternative: 2 FIM #4 Boiler Upgrade

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 2: Unit Ventilator Heating Only													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=520 cfm / 0.05 kW] (Room Exhaust Fan)													
Electric (kWh)	7.2	6.4	7.9	7.8	8.9	9.6	11.7	12.7	10.2	7.3	6.7	7.0	103.3
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 3: Unit Heaters													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,840 cfm / 0.14 kW] (Main Htg Fan)													
Electric (kWh)	103.4	93.4	103.4	100.1	103.4	100.1	103.4	103.4	100.1	103.4	100.1	103.4	1,217.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 4: Fin Tubes													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=930 cfm / 0.09 kW] (Room Exhaust Fan)													
Electric (kWh)	10.0	9.0	11.5	9.8	10.8	7.6	7.1	7.9	9.8	10.3	9.8	9.4	112.8
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1
Sys 5: Unit Ventilator with Cooling													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.21 kW] (Main Clg Fan)													
Electric (kWh)	66.6	57.5	64.4	53.6	58.5	10.4	13.4	20.2	49.8	54.8	62.0	70.5	581.6
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sys 6: Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=876.5 cfm / 0.07 kW] (Main Htg Fan)													
Electric (kWh)	27.5	24.3	25.9	22.2	22.6	11.0	10.7	10.7	21.1	23.8	25.0	26.7	251.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Sys 7: Unit Heaters Old Bldg													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=2,250 cfm / 0.17 kW] (Main Htg Fan)													
Electric (kWh)	126.4	114.2	126.4	122.4	126.4	122.4	126.4	126.4	122.4	126.4	122.4	126.4	1,488.7
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sys 8: Gym Gas Fired UH													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.11 kW] (Main Htg Fan)													
Electric (kWh)	57.6	51.9	49.5	37.5	33.5	21.9	18.1	20.9	30.1	43.5	51.7	56.4	472.5
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 3 FIM #5 Occupancy Sensors

------- Monthly Consumption -------

Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Lights													
Electric (kWh)	7,224.3	6,532.9	7,701.7	6,914.3	7,463.0	2,161.3	2,230.8	7,283.8	6,579.5	7,094.7	6,801.4	6,650.8	74,638.5
Peak (kW)	31.7	31.7	31.7	31.7	31.7	6.2	6.2	31.7	31.7	31.7	31.7	31.7	31.7
Misc. Ld													
Electric (kWh)	1,356.3	1,225.9	1,411.4	1,303.7	1,383.9	523.3	494.5	545.3	1,232.6	1,345.8	1,286.7	1,237.6	13,346.9
Peak (kW)	6.9	6.9	6.9	6.9	6.9	2.1	2.1	2.1	6.9	6.9	6.9	6.9	6.9
Cooling Coil Condensate													
Recoverable Water (1000gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Bsu 1: DHW- Galgate													
Gas (therms)	44.7	40.5	49.0	42.6	46.9	15.8	14.4	16.6	42.6	46.9	44.7	42.6	447.2
Peak (therms/Hr)	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Bsu 2: Galgate Kitchen Appliances													
Gas (therms)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (therms/Hr)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Bsu 3: Refrigerated Storage													
Electric (kWh)	891.6	806.7	976.5	849.1	934.0	127.6	116.0	133.4	901.9	992.0	946.9	901.9	8,577.6
Peak (kW)	4.0	4.0	4.0	4.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	4.0	4.0
Bsu 4: Domestic Hot Water (Elec)													
Electric (kWh)	298.2	269.8	326.6	284.0	312.4	105.6	96.0	110.4	284.0	312.4	298.2	284.0	2,981.6
Peak (kW)	2.0	2.0	2.0	2.0	2.0	0.6	0.6	0.6	2.0	2.0	2.0	2.0	2.0
Cpl 1: Cooling plant - 001 [Sum of dsn coil capacities=19.07 tons]													
Air-cooled unitary - 001 [Clg Nominal Capacity/F.L.Rate=19.07 tons / 19.92 kW] (Cooling Equipment)													
Electric (kWh)	0.0	0.0	12.3	41.9	77.5	91.9	138.8	186.2	152.0	19.1	0.0	0.0	719.6
Peak (kW)	0.0	0.0	3.6	3.8	4.0	4.4	4.8	4.7	4.4	3.7	0.0	0.0	4.8
Condenser fan for Recip [Design Heat Rejection/F.L.Rate=24.73 tons / 2.35 kW]													
Electric (kWh)	0.0	0.0	2.0	6.7	12.6	14.1	60.6	57.5	22.7	3.1	0.0	0.0	179.2
Peak (kW)	0.0	0.0	0.1	0.2	0.2	0.1	2.4	2.4	0.3	0.2	0.0	0.0	2.4
Cntl panel & interlocks - 0.3 KW (Misc Accessory Equipment)													
Electric (kWh)	0.0	0.0	12.0	24.3	53.1	101.7	154.8	159.9	80.1	10.8	0.0	0.0	596.7
Peak (kW)	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.3

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 3 FIM #5 Occupancy Sensors

					------- Monthly Consumption -------								
Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Hpl 1: Existing Lochinvar Boiler Plant [Sum of dsn coil capacities=394.7 mbh]													
Boiler - 001 [Nominal Capacity/F.L.Rate=750 mbh / 9.38 Therms] (Heating Equipment)													
Gas (therms)	676.0	575.5	390.7	186.8	82.2	10.0	0.2	0.1	46.4	226.0	438.1	587.2	3,219.0
Peak (therms/Hr)	4.9	4.9	4.5	3.0	2.0	0.6	0.0	0.0	2.0	3.1	4.6	4.6	4.9
Heating water circ pump (Misc Accessory Equipment)													
Electric (kWh)	184.9	167.0	169.3	135.2	89.0	34.1	1.7	1.7	57.9	153.1	177.2	184.9	1,356.2
Peak (kW)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Boiler forced draft fan (Misc Accessory Equipment)													
Electric (kWh)	558.0	504.0	510.8	408.0	268.5	102.8	5.3	5.3	174.8	462.0	534.8	558.0	4,092.0
Peak (kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	340.5	272.0	179.0	68.5	3.5	3.5	116.5	308.0	356.5	372.0	2,728.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,692.8	1,352.2	889.9	340.5	17.4	17.4	579.2	1,531.2	1,772.3	1,849.4	13,561.9
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Hpl 2: Gas Fired Heat Exchanger Plant [Sum of dsn coil capacities=214.3 mbh]													
Gas-fired heat exchanger - 005 [Nominal Capacity/F.L.Rate=200 mbh / 2.67 Therms] (Heating Equipment)													
Gas (therms)	787.2	670.5	494.8	254.9	120.0	56.8	0.3	0.0	77.0	326.5	570.6	731.9	4,090.3
Peak (therms/Hr)	2.2	2.5	1.8	1.2	1.0	0.8	0.1	0.0	0.9	1.2	1.9	1.9	2.5
Hpl 3: Burnham Boiler Plant [Sum of dsn coil capacities=387.3 mbh]													
Boiler - 003 [Nominal Capacity/F.L.Rate=387.3 mbh / 5.53 Therms] (Heating Equipment)													
Gas (therms)	1,130.6	911.4	619.1	258.4	95.1	32.5	0.8	0.0	77.1	388.2	770.7	1,053.3	5,337.2
Peak (therms/Hr)	3.7	4.1	3.2	2.2	1.7	1.1	0.2	0.0	1.6	2.2	3.2	3.5	4.1
Cntl panel & interlocks - 0.5 KW (Misc Accessory Equipment)													
Electric (kWh)	372.0	336.0	349.0	279.0	228.0	146.0	13.5	2.5	152.5	326.5	360.0	372.0	2,937.0
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
90.1 Min CV Hot Water pump (Misc Accessory Equipment)													
Electric (kWh)	1,849.4	1,670.4	1,735.0	1,387.0	1,133.5	725.8	67.1	12.4	758.1	1,623.2	1,789.7	1,849.4	14,600.9
Peak (kW)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 3 FIM #5 Occupancy Sensors

	------- Monthly Consumption -------												
Equipment - Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 1: Fan Coil													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=6,377 cfm / 0.48 kW] (Main Htg Fan)													
Electric (kWh)	223.7	196.8	202.7	171.2	171.3	87.6	90.7	89.8	160.1	185.9	200.8	216.6	1,997.2
Peak (kW)	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.1	0.5	0.5	0.5	0.5	0.5
FC Centrifugal const vol [DsnAirflow/F.L.Rate=300 cfm / 0.03 kW] (Room Exhaust Fan)													
Electric (kWh)	0.8	0.6	1.2	0.9	1.0	1.0	1.0	1.0	1.0	0.7	0.6	0.7	10.4
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 2: Unit Ventilator Heating Only													
Unit vent supply fan [DsnAirflow/F.L.Rate=12,995 cfm / 4.04 kW] (Main Clg Fan)													
Electric (kWh)	1,499.1	1,363.3	1,554.6	1,393.5	1,453.3	846.0	960.5	1,082.3	1,521.2	1,460.8	1,448.7	1,471.1	16,054.4
Peak (kW)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
FC Centrifugal const vol [DsnAirflow/F.L.Rate=520 cfm / 0.05 kW] (Room Exhaust Fan)													
Electric (kWh)	7.2	6.4	7.9	7.5	8.1	9.0	11.4	12.1	9.5	7.2	6.7	7.0	100.0
Peak (kW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sys 3: Unit Heaters													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,840 cfm / 0.14 kW] (Main Htg Fan)													
Electric (kWh)	103.4	93.4	103.4	100.1	103.4	100.1	103.4	103.4	100.1	103.4	100.1	103.4	1,217.4
Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sys 4: Fin Tubes													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=930 cfm / 0.09 kW] (Room Exhaust Fan)													
Electric (kWh)	10.0	9.0	11.5	9.8	10.7	7.6	7.1	7.9	9.8	10.3	9.8	9.4	112.8
Peak (kW)	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1
Sys 5: Unit Ventilator with Cooling													
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.21 kW] (Main Clg Fan)													
Electric (kWh)	75.1	64.3	71.5	55.2	58.9	10.6	13.7	18.2	49.4	54.4	63.0	72.3	606.4
Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sys 6: Gas Fired UH													

EQUIPMENT ENERGY CONSUMPTION

By CTA INC.

Alternative: 3 FIM #5 Occupancy Sensors

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
						------- Monthly Consumption -------								
Equipment - Utility		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Sys 6: Gas Fired UH														
FC Centrifugal const vol [DsnAirflow/F.L.Rate=876.5 cfm / 0.07 kW] (Main Htg Fan)														
	Electric (kWh)	27.8	24.6	26.2	22.4	22.7	11.0	10.7	10.7	21.2	23.9	25.1	26.8	253.1
	Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Sys 7: Unit Heaters Old Bldg														
FC Centrifugal const vol [DsnAirflow/F.L.Rate=2,250 cfm / 0.17 kW] (Main Htg Fan)														
	Electric (kWh)	126.4	114.2	126.4	122.4	126.4	122.4	126.4	126.4	122.4	126.4	122.4	126.4	1,488.7
	Peak (kW)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sys 8: Gym Gas Fired UH														
FC Centrifugal const vol [DsnAirflow/F.L.Rate=1,500 cfm / 0.11 kW] (Main Htg Fan)														
	Electric (kWh)	58.2	52.4	50.5	38.4	34.8	21.8	18.1	20.9	30.6	44.0	51.7	56.2	477.6
	Peak (kW)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

MONTHLY UTILITY COSTS

By CTA INC.

					-------	Monthly Utility Costs	-------						
Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative 1 BASE CASE - EXISTING SCHOOL													
Electric													
On-Pk Cons. ($)	1,644	1,487	1,692	1,463	1,478	464	381	1,044	1,237	1,505	1,516	1,505	15,415
On-Pk Demand ($)	530	530	530	530	530	266	266	422	531	530	530	530	5,726
Total ($):	2,174	2,017	2,222	1,994	2,008	730	647	1,466	1,769	2,035	2,046	2,035	21,142
Gas													
On-Pk Cons. ($)	2,592	2,185	1,641	919	600	271	175	188	522	1,174	1,893	2,414	14,574
Monthly Total ($):	4,766	4,202	3,863	2,913	2,608	1,001	822	1,655	2,290	3,208	3,939	4,449	35,716

Building Area = 32,576 ft²

Utility Cost Per Area = 1.10 $/ft²

Alternative 2 FIM #1 VENTILATION UPGRADE													
Electric													
On-Pk Cons. ($)	1,664	1,512	1,755	1,552	1,580	584	474	1,120	1,324	1,580	1,548	1,522	16,215
On-Pk Demand ($)	546	546	545	545	545	273	273	429	545	545	545	545	5,883
Total ($):	2,210	2,058	2,301	2,096	2,125	857	748	1,549	1,869	2,125	2,092	2,067	22,097
Gas													
On-Pk Cons. ($)	2,516	2,124	1,575	894	600	272	174	188	510	1,127	1,834	2,330	14,144
Monthly Total ($):	4,726	4,182	3,876	2,990	2,725	1,129	922	1,737	2,379	3,252	3,927	4,397	36,241

Building Area = 32,576 ft²

Utility Cost Per Area = 1.11 $/ft²

MONTHLY UTILITY COSTS

By CTA INC.

						------- Monthly Utility Costs -------							
Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative 3 FIM #2 GYM H&V UNIT UPGRADE													
Electric													
On-Pk Cons. ($)	1,642	1,485	1,691	1,465	1,482	481	381	1,044	1,245	1,506	1,515	1,503	15,439
On-Pk Demand ($)	530	530	530	530	530	281	281	422	562	530	530	530	5,786
Total ($):	2,172	2,015	2,221	1,995	2,012	762	662	1,466	1,807	2,036	2,045	2,033	21,225
Gas													
On-Pk Cons. ($)	2,399	2,020	1,513	839	572	260	175	188	495	1,068	1,739	2,223	13,491
Monthly Total ($):	4,571	4,035	3,735	2,834	2,584	1,022	837	1,654	2,302	3,104	3,783	4,256	34,716

Building Area = 32,576 ft²

Utility Cost Per Area = 1.07 $/ft²

Alternative 4 FIM #3 TEMPERATURE CONTROL UPGRADE													
Electric													
On-Pk Cons. ($)	1,614	1,459	1,658	1,431	1,445	443	355	1,018	1,205	1,463	1,484	1,475	15,050
On-Pk Demand ($)	527	527	527	526	525	264	264	419	524	525	527	527	5,682
Total ($):	2,142	1,986	2,185	1,957	1,970	707	619	1,436	1,730	1,988	2,011	2,002	20,732
Gas													
On-Pk Cons. ($)	2,177	1,837	1,366	750	555	196	174	188	464	931	1,540	1,968	12,146
Monthly Total ($):	4,318	3,823	3,551	2,707	2,525	902	792	1,624	2,194	2,919	3,551	3,970	32,878

Building Area = 32,576 ft²

Utility Cost Per Area = 1.01 $/ft²

MONTHLY UTILITY COSTS

By CTA INC.

					------- Monthly Utility Costs -------								
Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative 2 FIM #4 Boiler Upgrade													
Electric													
On-Pk Cons. ($)	1,525	1,379	1,599	1,403	1,464	479	386	1,045	1,229	1,435	1,407	1,386	14,737
On-Pk Demand ($)	513	513	543	545	546	274	274	437	548	547	513	513	5,768
Total ($):	2,038	1,893	2,142	1,948	2,010	753	660	1,482	1,777	1,981	1,921	1,899	20,504
Gas													
On-Pk Cons. ($)	2,210	1,846	1,353	743	521	242	174	188	459	939	1,556	2,044	12,276
Monthly Total ($):	4,248	3,738	3,495	2,691	2,531	995	834	1,671	2,236	2,920	3,477	3,944	32,781

Building Area = 32,576 ft²

Utility Cost Per Area = 1.01 $/ft²

Alternative 3 FIM #5 Lighting Controls													
Electric													
On-Pk Cons. ($)	1,367	1,236	1,392	1,214	1,201	461	379	799	1,049	1,296	1,308	1,308	13,011
On-Pk Demand ($)	480	480	480	480	481	241	241	373	482	481	480	480	5,181
Total ($):	1,847	1,716	1,872	1,695	1,682	702	621	1,172	1,532	1,777	1,788	1,788	18,192
Gas													
On-Pk Cons. ($)	2,717	2,295	1,766	998	665	273	175	188	548	1,244	1,984	2,503	15,356
Monthly Total ($):	4,564	4,011	3,638	2,692	2,347	975	795	1,361	2,080	3,021	3,772	4,291	33,548

Building Area = 32,576 ft²

Utility Cost Per Area = 1.03 $/ft²

APPENDIX D

Gallatin Gateway School

Gallatin Gateway, MONTANA

FACILITY IMPROVEMENT MEASURE

COST ESTIMATES

Index **Page**

FIM #1 - Ventilation Upgrade D1

FIM #2 - Gym H&V Unit Heating D2

FIM #3 - Temperature Control Upgrade D3

FIM #4 - Boiler Replacement D4

FIM #5 - Lighting Controls D5

FIM #6 - Crawl Space Ventilation D6

CTA QSF-7 Cost

Ventilation Upgrade
Gallatin Gateway School
Gallatin Gateway Montana

Facility Improvement Measure #1 **Ventilation Upgrade**	QUANTITY		MATERIAL		LABOR		
	No. Units	Unit Meas.	Per Unit	TOTAL	Per Unit	TOTAL	TOTAL COST
Demolition							
Block Unit Ventilator Outside air damper	3	ea	$50.00	$150	$75.00	$225	$375
						Subtotal Demolition	**$375**
Remodel Work							
Kitchen Make Up Air Unit	1	EA	$12,000.00	$12,000	$2,500.00	$2,500	$14,500
Make-up Ductwork	375	Lbs	$0.90	$338	$6.88	$2,580	$2,918
Temperature Controls per unit	4	EA	$1,500.00	$6,000	$1,000.00	$4,000	$10,000
Electrical Hook-Up	4	Ea	$500.00	$2,000	$1,400.00	$5,600	$7,600
Ventilation and Exhaust Ductwork	2700	LBS	$0.90	$2,430	$6.88	$18,576	$21,006
Heat Recovery Ventilators	3	EA	$6,000.00	$18,000	$1,200.00	$3,600	$21,600
Heating Water Hook up/ piping	3	EA	$700.00	$2,100	$700.00	$2,100	$4,200
	0	EA	$0.00	$0	$125.00	$0	$0
	0	EA	$0.00	$0	$50.00	$0	$0
	0	EA	$0.00	$0	$65.00	$0	$0
	0	EA	$0.00	$0	$75.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
						Subtotal Remodel	**$81,824**
Project Subtotal							**$82,199**
Engineering Fees	*8.00%*						**$6,576**
General Contractor Overhead, Profit , Bonds, Insurance	*10.00%*						**$8,220**
Montana Gross Receipts Tax	*1.00%*						**$822**
Building Permits	*2.00%*						**$1,644**
Subtotal-Construction Costs							**$99,460**
Contingency	*10.00%*						**$9,946**
TOTAL PROJECT COSTS							**$109,406**

CTA QSF-7 Cost

Gym H&V Unit Upgrade
Gallatin Gateway School
Gallatin Gateway Montana

Facility Improvement Measure #2 **Gym H&V Unit Upgrade**	QUANTITY		MATERIAL		LABOR		TOTAL COST
	No. Units	Unit Meas.	Per Unit	TOTAL	Per Unit	TOTAL	
Demolition							
Remove Existing Duct Furnace Section	2	EA	$0.00	$0	$1,200.00	$2,400	$2,400
Flue Vent Roof Repair	4	EA	$150.00	$600	$350.00	$1,400	$2,000
						Subtotal Demolition	**$4,400**
Remodel Work							
New Heating Water Coil	2	EA	$1,170.00	$2,340	$500.00	$1,000	$3,340
DDC Temperature Controls	1	LS	$7,500.00	$7,500	$6,500.00	$6,500	$14,000
Electrical Hook Up	2	EA	$500.00	$1,000	$800.00	$1,600	$2,600
1-1/4" HW Piping Type "L" copper	600	LF	$17.43	$10,458	$10.37	$6,222	$16,680
Pipe Insulation	600	LF	$2.96	$1,776	$4.73	$2,838	$4,614
Pipe Hook Up to Coil	2	EA	$450.00	$900	$450.00	$900	$1,800
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
						Subtotal Remodel	**$43,034**
Project Subtotal							**$47,434**
Engineering Fees	*8.00%*						**$3,795**
General Contractor Overhead, Profit , Bonds, Insurance	*0.00%*						**$0**
Montana Gross Receipts Tax	*1.00%*						**$474**
Building Permits	*2.00%*						**$949**
Subtotal-Construction Costs							**$52,652**
Contingency	*5.00%*						**$2,633**
TOTAL PROJECT COSTS							**$55,284**

CTA QSF-7 Cost

Temperature Control Replacement
Gallatin Gateway School
Gallatin Gateway Montana

Facility Improvement Measure #3 **Temperature Control Upgrade**	**QUANTITY**		**MATERIAL**		**LABOR**		TOTAL COST
	No. Units	Unit Meas.	Per Unit	TOTAL	Per Unit	TOTAL	
Remove Existing Pneumatic/Electric Controls	40	hr	$0.00	$0	$75.00	$3,000	$3,000
Fan Coil Unit Controllers / DDC Sensor	16	EA	$800.00	$12,800	$700.00	$11,200	$24,000
DDC Sensor / Radiation Valve	6	EA	$225.00	$1,350	$150.00	$900	$2,250
Front End Programming Network Controller	1	EA	$8,500.00	$8,500	$5,000.00	$5,000	$13,500
8 input / 8 output zone controllers	1	EA	$800.00	$800	$875.00	$875	$1,675
Conference Room Unit Vent upgrade	1	LS	$2,500.00	$2,500	$1,875.00	$1,875	$4,375
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
						Subtotal Remodel	**$48,800**
Engineering Fees	*6.00%*						**$2,928**
General Contractor Overhead, Profit , Bonds, Insurance	*0.00%*						**$0**
Montana Gross Receipts Tax	*1.00%*						**$488**
Building Permits	*2.00%*						**$1,044**
Subtotal-Construction Costs							**$53,260**
Contingency	*10.00%*						**$5,326**
TOTAL PROJECT COSTS							**$58,586**

CTA QSF-7 Cost

Replace Boilers
Gallatin Gateway School
Gallatin Gateway Montana

Facility Improvement Measure #4 **Replace Boilers**	QUANTITY		MATERIAL		LABOR		TOTAL COST
	No. Units	Unit Meas.	Per Unit	TOTAL	Per Unit	TOTAL	
Demolition							
Remove Existing Lochinvar Boilers	75	hr	$0.00	$0	$85.00	$6,375	$6,375
Remove Misc. Piping	4	hr	$0.00	$0	$85.00	$340	$340
						Subtotal Demolition	**$6,715**
Remodel Work							
New 800 MBH Condensing Boilers	2	EA	$22,000.00	$44,000	$5,500.00	$11,000	$55,000
Primary Boiler Pumps	2	EA	$1,200.00	$2,400	$385.00	$770	$3,170
Boiler Plant Piping & Interconnection w/ Insulation	650	LF	$22.00	$14,300	$32.00	$20,800	$35,100
Flue Vent Piping	40	LF	$125.00	$5,000	$30.00	$1,200	$6,200
Main HW Isolation Valves	8	LS	$185.00	$1,480	$125.00	$1,000	$2,480
Temperature Controls Lump Sum	1	LS	$3,500.00	$3,500	$3,500.00	$3,500	$7,000
Electrical Hook Up	1	LS	$1,200.00	$1,200	$2,500.00	$2,500	$3,700
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LF	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
						Subtotal Remodel	**$112,650**
Project Subtotal							**$119,365**
Engineering Fees	*8.00%*						**$9,549**
General Contractor Overhead, Profit , Bonds, Insurance	*0.00%*						**$0**
Montana Gross Receipts Tax	*1.00%*						**$1,194**
Building Permits	*2.00%*						**$2,387**
Subtotal-Construction Costs							**$132,495**
Contingency	*10.00%*						**$13,250**
TOTAL PROJECT COSTS							**$145,745**

CTA QSF-7 Cost

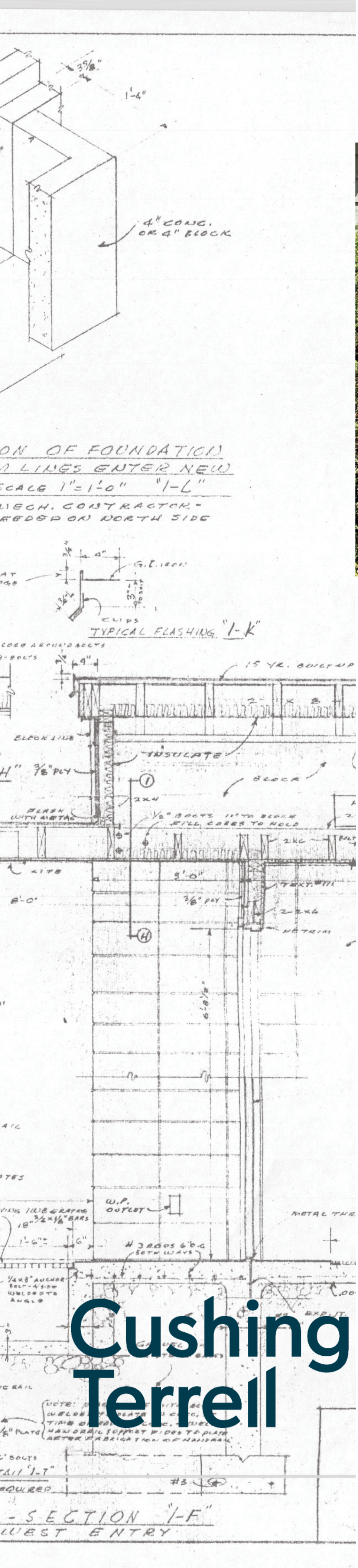
Lighting Controls
Gallatin Gateway School
Gallatin Gateway Montana

Facility Improvement Measure #5 **Lighting Controls**	QUANTITY		MATERIAL		LABOR		TOTAL COST
	No. Units	Unit Meas.	Per Unit	TOTAL	Per Unit	TOTAL	
Remove existing wall mounted switches	30	EA	$0.00	$0	$15.00	$450	$450
Occupancy Sensors	50	EA	$165.00	$8,250	$40.00	$2,000	$10,250
Lighting Controls - relay panels and override switches	1	EA	$6,000.00	$6,000	$550.00	$550	$6,550
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
						Subtotal Remodel	**$17,250**
Engineering Fees	*6.00%*						**$1,035**
General Contractor Overhead, Profit , Bonds, Insurance	*0.00%*						**$0**
Montana Gross Receipts Tax	*1.00%*						**$173**
Building Permits	*2.00%*						**$369**
Subtotal-Construction Costs							**$18,827**
Contingency	*10.00%*						**$1,883**
TOTAL PROJECT COSTS							**$20,709**

CTA QSF-7 Cost

Crawl Space Ventilation
Gallatin Gateway School
Gallatin Gateway Montana

Facility Improvement Measure #6 **Crawl Space Ventilation**	QUANTITY		MATERIAL		LABOR		TOTAL COST
	No. Units	Unit Meas.	Per Unit	TOTAL	Per Unit	TOTAL	
Current Transducer / Status Input to Controller	3	EA	$250.00	$750	$300.00	$900	$1,650
Visual Alarm Indication	1	EA	$350.00	$350	$125.00	$125	$475
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	EA	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
	0	LS	$0.00	$0	$0.00	$0	$0
						Subtotal Remodel	**$2,125**
Engineering Fees	*6.00%*						**$128**
General Contractor Overhead, Profit , Bonds, Insurance	*0.00%*						**$0**
Montana Gross Receipts Tax	*1.00%*						**$21**
Building Permits	*2.00%*						**$45**
Subtotal-Construction Costs							**$2,319**
Contingency	*10.00%*						**$232**
TOTAL PROJECT COSTS							**$2,551**



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