A C E
Associated
Construction
Engineering, Inc.
www.acemt.com

12 North Broadway
Belgrade, MT 59714
406-388-3320
Fax 406-388-3389

100 North 27th Street
Suite 600
Billings, MT 59101
406-245-0136
Fax 406-245-2084

101 East Broadway
Suite 410
Missoula, MT 59802
406-549-4160
Fax 406-549-4062

Facility Analysis Review

Gallatin Gateway K-8 School
Gallatin Gateway, MT
A.C.E. Job #0BL2361
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Prepared By:

Associated Construction Engineering, Inc.
100 North 27th Street, Suite 600
Billings MT 59101
www.acemt.com

Prepared For:

JGA Architects
644 Grand Avenue
Billings MT 59101

Introduction:

On Friday, May 19, 2000, Mr. Keith Campbell; Mechanical Engineer, and Mr. Paul Marcoff; Electrical Engineer, of Associated Construction Engineering, Inc., performed an on-site walk through of the existing K-8 Elementary School in Gallatin Gateway, MT. Mr. Charles Proffitt of the school district accompanied the walk through of the facility to assist with system and facility questions.

The following is a descriptive overview of the systems encountered, inclusive of evident code deficiencies and general concerns realized through this exercise.

I. Heating, Ventilation, and Air Condition Systems:

In 1991 a mechanical system upgrade was performed at the facility to replace the existing steam boiler plant with a new natural gas-fired hot-water boiler plant. The current boiler plant consists of two Raypak Model No. HI-0403B-CCARBAA natural gas-fired hot-water boilers. The input rating for these boilers are 399,000 BTUH each, the output rating is 319,000 BTUH each. The mechanical upgrade consisted of new hot water supply and return distribution piping which is type M, insulated copper piping.

The facility is broken in to three main circulating zones, with associated Grundfos in-line-circulating pumps located in the basement boiler room. A Tekmar boiler control panel is utilized to ramp the hot water supply temperature with the outdoor air temperature. This system also has automatic boiler shut off control logic which disables the boiler operation once an outdoor temperature of 65°F is reached.

The 1991 mechanical upgrade project, as mentioned previously, replaced the boilers, main distribution lines, and the terminal heating units which were steam radiators with new hot water, floor mounted, 2-pipe fan coil units. It also appears that the controls were upgrade from an original Johnson Controls pneumatic system to programmable electric wall mounted thermostats for each of the individual classrooms.

The original steam boiler and associated piping has been disconnected and abandoned in the basement and associated pipe tunnels in its original location.

While the heating appears to be sufficient to adequately condition the existing space, it is doubtful that the plant has capacity in the boiler sizing or pipe sizing to accommodate any substantial addition or alteration to this facility.

Also, the ventilation found in this facility is limited to the newer East Wing addition, which comprises of the sixth, seventh, and eighth grade classrooms along with the gymnasium and music room. Other than this, ventilation is essentially nonexistent to the remainder of the facility. This is obviously in

conflict with the 1997 Uniform Building Code, which requires a mechanical ventilation standard of at least 15 CFM of outdoor air per occupant.

There exists no mechanical air conditioning in the facility at this time. The facility exhaust system is limited to select restrooms. There are a number of utility-janitor closet spaces and smaller connecting bathrooms in the 1966 West Wing, which lack code required exhaust systems.

The kitchen-cafeteria area is heated utilizing natural gas-fired Reznor unit heaters. The kitchen also has a canopy hood over the stove and oven area to provide hood protection for this cooking facility. However, makeup air to this space is marginal and most likely not code compliant with the current editions of the Uniform Mechanical and Uniform Building Codes.

Finally, the gymnasium is heated utilizing natural gas-fired unit heaters, which are controlled by the original Johnson Control pneumatic system.

II. Plumbing Systems:

The existing facility is serviced by water well and septic system. There currently exists two wells, one dedicated for irrigation, and the other dedicated for domestic water usage in the facility. The kitchen is serviced by a natural gas-fired A.O. Smith hot water heater. This water heater has 75 gallons capacity and input rating of 75,100 BTUH. The kitchen also has an electric booster heater for dish washing purposes.

The remainder of the facility is serviced by a smaller, approximately 50-gallon natural gas-fired water heater located in the basement boiler room. Piping throughout the facility appears to vary dependent upon the age and condition of the piping and whether or not it has been replaced.

Typically throughout the facility the domestic hot water and cold water piping is found to be copper and insulated. The sewer piping ranges from hub cast iron piping to schedule 40 PVC, sanitary waste and vent piping. The plumbing facilities throughout the restrooms are minimal at best and may not meet the current Uniform Building Code requirements for the number of fixtures given the number of occupants of the facility. None of the restrooms in the facility appear to comply with ADA guidelines either in the plumbing fixture type or in adequate access to the restroom facilities.

The fixtures throughout the facility are flush tank style rather than flush valve, which is typical given the fact that the facility is on a water well and not on a city water system. There exists no water treatment systems, either chemically for the boiler system or for softening/purification of the domestic water system in the facility.

The natural gas service meter is located on the North side of the building, just east of the 1914 structure. The service is provided by the Montana Power Company and provides adequate gas distribution with threaded black steel pipe routed throughout the facility to the basement boiler room, the main level kitchen area, and to gas-fired unit heaters in the gymnasium and cafeteria areas.

No storm drainage piping exists; any rainwater is diverted with gutters and down spouts spilled daylight to grade.

III. Fire Protection Systems:

The fire alarm system found in the facility is a limited basic fire alarm system for this facility. See the Electrical Narrative for a descriptive overview of the fire alarm system.

No fire sprinklers, fire stand pipes, etc., exist in the facility. The fire protection systems are limited to wall and cabinet mounted type ABC fire extinguishers scattered throughout the facility.

IV. Electrical Systems:

The main service for the school is a 600 amp, 120/240 volt, single phase, three wire service. This main distribution panel feeds several branch circuit panels in various parts of the facility. Branch circuit panels range widely in age with most being obsolete and capacity for spare circuits is limited or non-existent. Replacement breakers for some of these panels may be extremely difficult to find.

Some classrooms in the old building have had receptacles added which are fed through conduit run on the surface. It is not clear as to whether these additional receptacles feed from existing receptacles or are new circuits run from branch circuit panels. Although conduit is visible in many places in the old building, it would be safe to assume that some of the old "knob and tube" wiring remains. Consequently, the "knob and tube" wiring does not incorporate a grounding conductor, creating a hazard to personnel, as well as, diminished protection for electronic equipment such as computers, projectors, etc. Degradation of the insulation of the original wiring also poses possible hazards to property and personnel.

In as much as the National Electrical Code does not address receptacle requirements in occupancies other than residential, the number of receptacles in classrooms may be inadequate due to the quantity of electrical devices now used as teaching aids. The lack of receptacles is conducive to the use of extension cords creating both fire and tripping hazards.

Most of the lighting in the facility consists of fluorescent type with incandescent in some ancillary areas such as janitor closets and mechanical rooms. The fluorescent lighting appears to have been retrofitted with electronic ballasts and T-8 lamps. Light meter readings indicate that most spaces are adequately lit and footcandle levels are at or above IES (Illuminating Engineers Society) recommendations.

Corridors	60 fc ave.
Classrooms	50 fc ave.
Cafeteria	27 fc ave.
Library	33 fc ave.
Kitchen	60 fc ave.
Gym	50 fc ave.

Acrylic lenses have yellowed with age and diminished lighting output.

The gym features 400 watt metal halide H.I.D. fixtures which more than adequately light the facility.

NFPA 101 LIFE SAFETY CODE requires that 1 footcandle of lighting be available at points of egress and along the path of egress. At present, it does not appear that existing fixtures would meet this requirement. Additional emergency lighting would be required in corridors. It is also recommended that emergency egress lighting be installed in restrooms which do not have windows supplying adequate ambient light.

The existing fire alarm system is an Edwards 1520A panel. Several doors do not have manual pull stations as required by code. It was also noted that several smoke detectors may not be an integral part of the fire alarm system and may be local in nature. Code requires that smoke detectors be located within 10 feet of a fire rated door and then spaced within 30 feet of one another down corridors. Janitor closets, mechanical rooms, storage areas, and other such spaces not normally occupied should also have smoke detectors. Horn/strobes should be placed down corridors so as to meet the 15dB above ambient noise requirement. Horn/strobes should also be placed in restrooms to meet ADA requirements. At present, it appears that the fire alarm system incorporates only one zone. This configuration makes locating the fire difficult for firefighters entering the building.

V. Recommendations & Conclusions:

Mechanical / Plumbing / Fire Protection

1. There are numerous locations throughout the facility in which proper separations (i.e., floor to floor, mechanical / boiler rooms etc.,) have not been appropriately sealed and/or dampered, thereby, negating the integrity

of the fire and/or fire smoke separation wall which is required by current code standards. These areas deserve appropriate attention, as they are a life safety issue.

2. The basement of the facility would require mandatory fire sprinklers under the current code requirements if it exceeds 1,500 sq. ft. in floor area.

3. While the boiler plant has been recently upgraded, (1991), it appears to be operational and in reasonably good condition. It does not appear to have adequate capacity to service any sizable addition and/or alteration. Therefore, either an additional or separate plant would have to be added or this plant would have to be upgraded to service such an addition or alteration.

4. There are numerous locations in which corridor doors are louvered without appropriate fire dampering. Also, egress corridors are not appropriately rated per the current requirements of the Uniform Building Code.

5. The combustion air to the basement boiler plant appears to be inadequate given the capacity of the existing plant. Also, the distribution of combustion air is not in compliance with the current requirements of the Uniform Mechanical Code.

6. While not a code requirement, the facilities do not appear to comply with any requirements of the American with Disabilities Act. These issues may be resolved upon final definition of the scope of the project.

7. The existing facility supports mechanical ventilation only in the latest addition of the East wing of the facility. This wing includes the sixth grade classroom, seventh grade classroom, and eighth grade classroom, music room and the gymnasium. The remainder of the facility has no mechanical ventilation capabilities. The current edition of the Uniform Building Code requires a mechanical ventilation rate of at least 15 CFM of outdoor air per occupant.

8. While is was not physically substantiated at the field site visit, a physical investigation should be conducted to verify the existence of any asbestos on abandoned pipe insulation, etc.

9. There are various restrooms and janitor closets throughout the facility, which by code, require mechanical exhaust systems. While the site visit revealed no mechanical exhaust systems for these facilities, this issue should be addressed once a scope of work is determined for the project in order to bring the mechanical ventilation standards of these spaces up to standard code requirements.

10. While not a code issue, the scope of the project should include a review of specific areas which may require mechanical air conditioning specifically computer room labs, etc…These spaces typically generate a fair amount of heat rejected to the ambient space causing an uncomfortable learning environment for students and staff.

Electrical

1. At the present time, it appears that the service is adequate for the facility, however, any expansion to the present facility would require a service upgrade. Should this happen, it is recommended that a 120/208 volt, three phase service be installed. In existing areas, branch circuit panels should be replaced, "knob and tube" wiring eliminated, and ground wires installed in conduits.

2. It is recommended that the acrylic lenses in the classrooms be changed to enhance available light.

3. All exit lighting should be equipped with battery back-up or should be self-illuminating.

4. It is recommended that the fire alarm system be upgraded to an addressable system with multiple zones. An addressable system allows for easier maintenance by indicating which device is in need of service. The multiple zone allows firefighters to pinpoint the fire at a glance upon entering the facility. Smoke detectors should be installed in accordance with code and heat detectors should be added to mechanical rooms for added safety.