

GENERAL BUILDING OPERATION

Daily/Weekly O&M Tasks

- Provide remote BPOs with iPads/tablets and use video Facetime to troubleshoot issues.
 - Also good to scope maintenance/repair work in advance of traveling to the site including verification of what parts and tools need to be brought to complete the repair.
- Use District web page to share information, O&M manual information, and training manuals and videos.
- Keep record drawings and O&M manuals electronically. Scan existing paper documents so that they don't get lost.
- Speak to Users (Teachers, etc.) daily and ask about changes in systems you may not notice.
- Require DDC and other service agencies to operate and maintain the systems based on maximizing energy efficiency and not just keeping the facilities operating. Include in your service agreements.
- Conduct annual building performance assessments by staff.

Capital Improvement Upgrades

- Require in your design contract that the design team provide CAD drawings (AutoCAD or Revit format) of the record drawings at the end of the project so that you don't pay future design teams to redraw the floor plan and systems. Saves the Owner money!
- Emphasize upgrades that lower fuel consumption for smaller communities. Savings from reducing electrical power usage are often offset by immediate increases in electrical utility rates by local provider.
- Install technology that allows remote metering and trending of fuel and electricity usage. Match with outputs meters (such as BTU meters) to evaluate energy efficiency of the facility.
 - Consider creating an "energy dashboard" for each school and have it viewable by staff and students so they can see the real-time energy use of the facility.
- Keep the control systems simple.
- Be wary of Contractor "Value Engineering" suggestions. These often times provide lesser quality materials or systems that require more long term maintenance.
- Look into alternative project delivery mechanisms such as CMGC/CMAR (Contractor at Risk) in place of traditional design-bid model. Leverage knowledge and experience of your construction team during the design process to make for a cost-effective facility and easier construction.
- Require Record Drawings in both the construction and design contracts.
 - This also includes contractor shop drawings for sprinkler system, fire alarm, BAS control diagrams, and other performance based designs.
 - Receive and store the documents electronically.
- Withhold a significant amount of money in the contract Schedule of Values for Contractor Record/Redline Drawings to ensure it gets completed and submitted. Contractor will skip small amounts of money at end of project.
 - Consider naming the line item as "Contract Close-Out" and also including Owner Training and O&M manuals.

- Include ADA/Accessibility upgrades within the building and the surrounding site access at every opportunity.
- Staff writing and approving grants need to consult with proper Facility Staff prior to submission.
- Add more storage space.
- Create state-wide purchasing agreements with suppliers to improve buying power and reduce costs.

Design Best Practices to Support O&M

- Don't use "boiler plate" specifications. Specs need to be written specific to the job and the equipment being used.
- Use standardized manufacturers and products to simplify replacement and reduce maintenance materials (spare parts). Typical for all building systems.
- Acquire local knowledge and help when orienting the building. Particularly in regards to wind directions and snow drifting.

BUILDING ENVELOPE AND EXTERIOR

Daily/Weekly O&M Tasks

- Have custodial or other building staff complete daily grounds inspections (lights off, windows closed, etc.)
- Remove roof debris.

Capital Improvement Upgrades

- Include ADA/Accessibility upgrades at every opportunity.
- Make and keep good communication with the Districts and schools for ongoing issues they need to know about and as changes in status occur.

Design Best Practices to Support O&M

- Site
 - Design steps and railings to facilitate snow removal.
 - Design parking lots to facilitate snow removal and storage.
 - Ensure enough parking places still existing with snow piles.
 - Design for ADA/Accessibility including access to school, playground and other areas.
- Envelope
 - Design walls that can't be climbed.
 - Assume all sealants will fail.
- Roof
 - Use a higher pitch roof to reduce snow buildup.
 - Provide anchor points.
- Windows
 - Use smaller size operable windows that can be more easily operated and replaced.
 - Use smaller size window modules that, if broken, do not cost a lot of money to replace.
- Design air intake locations with good indoor air quality in mind. Watch for proximity of idling vehicles and boiler flues. Look at wind patterns that occur throughout the year.
- Provide covered walkways, stairwells, and entries.
- Landscaping
 - Do not put landscaping (trees, bushes, etc) next to the building.
- Playgrounds
 - Design equipment that is age-appropriate.
 - Use non-flammable materials (particularly surfacing materials).
 - Use surfacing materials that stay resilient year-round.

INTERIOR FINISHES AND LAYOUT

Daily/Weekly O&M Tasks

- Turn off the lights.

Capital Improvement Upgrades

- Upgrade gym floors. Rubber/urethane floors can be restored by just adding a thin-layer of new material rather than having to replace the whole floor system.
- Replace classroom carpeting with vinyl flooring. More healthier.
- Replace carpet and walk-off mats with carpet squares.

Design Best Practices to Support O&M

- Use carpet squares.
- Standardize classroom technologies (smart boards, computers, etc)
- Reduce the use of moveable walls.
- Design versatile classrooms that can be used for different activities and teaching styles.
- Design bathroom wall and floor finishes to facilitate hose spray-down cleaning techniques.
- Specify vandal-proof finishes.
- Casework
 - Design lots of storage space into classrooms.
- Floor Plan
 - Provide more storage for school and maintenance functions.
 - Provide adequate storage for janitorial supplies.
 - Do not build arctic entries with really high ceilings.
 - Ensure building has space for a workshop for onsite repairs and maintenance support.

MECHANICAL SYSTEMS

Daily/Weekly O&M Tasks

- Full daily walk throughs.
 - Record/Document mechanical system performance (system pressures, operating temperatures, etc) on a daily/weekly basis.
- Review automation reports regularly.
- Provide isolation valves on automatic air vents and keep them isolated in most locations.
- Test for electrolysis in sprinkler pipes to prevent corrosion.

Capital Improvement Upgrades

- Building Automation Systems
 - Simplify the control systems.
 - Add automation and remote monitoring.
 - Select contractors based on performance during construction and most importantly on support after construction. Complete research on firms from other School Districts.
 - Specify “open” communication protocols such as BACnet or LonTalk. Specify system architecture to reduce proprietary networks that keep you locked into a specific vendor.
- Be sure to install cooling unit when a cooler or freezer are installed.
- Consider using Aquatherm (manufacturer of PP-R piping) in place of steel or copper on new or major replacement projects. It is lighter and easier to install, is fused like HDPE and therefore reduces fire risk from torches during construction, and has a 10 year warranty against leaks.
 - Consult with an engineer and other School Districts (such as Mat-Su School District) familiar with this product.
 - Do not use PP-R with systems that have a lot of copper pipes still in the system as the copper can lead to catastrophic failure of the PP-R pipe.
 - Ensure that first project includes providing the School District the installation tools used at the jobsite. They are expensive tools to purchase through operating budgets and are needed for maintenance.
 - Plumbing rough-in terminations (angle stops and flush valves) need to be supported to structure. Otherwise flush valves will move and be prone to leaking.

Design Best Practices to Support O&M

- Keep it simple.
- Keep the control systems simple.
- Design for the end user.
 - Bigger, more pieces and parts are not always better.
 - Not all maintenance personnel can operate all equipment. Design complexity around the capabilities of the staff on site.
- Design fan rooms such that you can gain access everywhere without having to climb over ducts.

- Provide easy access to air handling units.
- Minimum 30" wide x 60" high access corridor to all parts of the mechanical rooms.
- Valves
 - More valves on all mechanical system distribution piping.
 - Provide valves upstream and downstream of all replaceable parts.
 - Valves, valves, valves. More isolation valves!
 - Do not use gate valves.
- Provide more unions/flanges at equipment and in the mechanical piping to facilitate maintenance.
 - Do not use dielectric unions. Use dielectric nipples with bronze unions or flanges with isolation gasket kits.
- Specify and show on the drawing details more high point vents and low point drains.
- Air vents
 - Provide isolation valves on automatic air vents. They are typically isolated.
 - Specify high quality air vents such as the Spirovent system.
 - Consider detailing manual air vents as 1/4" isolation valve and 180 degree bend with a hose connection so that discharge can be directed to a bucket.
- Specify and show on the drawing details ample uses of thermometers and pressure gauges.
- Keep all piping and ductwork within the thermal envelope.
- Plumbing
 - Locate waste pipe cleanouts in accessible locations.
 - Provide cold water hose bibb (in locked cabinets) in restrooms to allow cleaning through hosing down the surfaces.
 - Specify floor-mount janitor closets.
- Provide VFDs or soft starts on larger motors.
- Provide platforms around any mechanical parts/equipment that need repairs.
- Corrosion
 - Test for electrolysis in sprinkler pipes to prevent corrosion.
 - Ground your water, heating, and sprinkler piping systems to reduce electrolysis.

ELECTRICAL SYSTEMS

Daily/Weekly O&M Tasks

- Inspect exterior electrical outlets and equipment for corrosion from salt water on the coast.

Capital Improvement Upgrades

- Add universal generator connections on exterior of the building so that portable/mobile generators can be used. Provides redundancy for standby generators.
- Upgrade automatic transfer switches.
- Add motion detectors to save electricity.

Design Best Practices to Support O&M

- In coastal communities, specify exterior electrical outlets and equipment to be of materials not prone to salt water corrosion.
- Specify underground power and data lines be provided with tracing wire for field locates.
- Design around brownouts in rural communities.
- Security
 - Do not purchase server type security systems. Use a dedicated system.

STRUCTURAL SYSTEMS

Daily/Weekly O&M Tasks

- Identify and remove vegetation that may be growing around foundations.
- Keep up on yearly shoring of foundations/piling.
- Identify and fix building envelope (roof, exterior wall, windows) leaks. They lead to dry rot and cost a lot of money in the long run.
- Examine welds and bolted connections. Particularly where exposed to the weather.

Capital Improvement Upgrades

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Design Best Practices to Support O&M

- Coordinate supports for piping and heavy equipment. Coordinate anchor load points for piping system expansion.
- Foundations
 - Triodetic foundations are fantastic for shirting ground and flood zones for smaller buildings, (< 10,000 SF).
- Coordinate structural design for anticipated drifting areas.
- Cover/Conceal wooden structures that would otherwise be exposed to the weather.
- Avoid structural members penetrating thermal envelope, eliminate thermal bridging.