# Project Lessons Learned Update



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| Complex energy management systems are not needed, and have little value on public safety buildings that operate 24/7 | Lighting ballasts can not be integral to the fixture. | Trade inspections need to be thorough, often, and scheduled at appropriate times. As part of the final inspection protocols the architect should be required to provide information needed to obtain utility rebates as specified in the utility minimum requirements document (MRD).. | Integrated design meetings are essential for a successful project. These should include all sub consultants. It would be helpful to include the utilities in this process for the purposes of streamlining the rebate process and taking advantage of their resources. We should also be including EV charging stations and solar readiness in all designs. We may also want to add a sustainability consultant to the design team. The sustainability consultant would have lead responsibility for including passive house design principals and electrification in the design process and also obtaining Alternative Energy Credits for heat pump equipment. | Never spend money you don't have. In order to ensure this does not happen, replenish the Mayor's contingency as frequently as possible. |
| Extreme care must be given to the sizing of MEP equipment. This equipment is typically oversized well above what is actually needed. | Walk-out roof access should be provided when possible. If this is not possible, ships ladders are next best, last option is fixed ladders. If you do not provide access to a roof, it, and the equipment on it, will not be maintained. | P-traps have to be verified to have been installed prior to installation of pan-type drains. Trap primers should be specified as much as possible. | Project expectations need to be clearly set, stated, and documented before design begins. | Working groups should involve elected officials when appropriate. This helps keep the CC updated and makes the process smoother. |

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| When MEP equipment sizing is reduced, ensure that all other impacted areas are adjusted as well. Structural for example. As we build all electric buildings we should be thinking about emergency generator requirements and sizing. | Avoid gutters and downspouts whenever possible. Interior roof drains are best. Gutters and downspouts get clogged, freeze up, and create water and ice issues wherever they drain to. Can not stress this point enough. Great care and detail need to go into how water comes off of roofs. It would be good practice to visually inspect roofs of existing buildings twice per year to make sure drains are clear and there is no pondng of water. | The site should be secured as soon as the contractor takes control of the property. There should be no delay in this. Site specific safety and logistics plan should be setup and approved and adhered to, | Establish an energy performance target before a designer is brought on board, and then make sure they know what it is, and how we want to achieve it. | For larger projects, and projects that have significant impacts on the community, establish routine community meetings to receive feedback and to provide updates. Make yourself present when working in a neighborhood as you develop a comfort level for Neighbors. |
| Perimeter radiation is rarely needed with the efficient envelope and window systems we specify. | Avoid low small roofs. These typically do not have easy access which means that they don't get quality maintenance. | The CMP needs to be reviewed with Police, Fire, and Traffic during draft stage. | Utilize the integrated design meetings to meet the energy target. | In cases where night work, or work that severely impacts the neighborhood, over communicate and use every means of communication possible. |
| Glazing systems are inherently less efficient and therefore no glazing should be specified that is not requested or needed. | Be very careful with trees next to buildings. Roots damage the foundation, the trees can provide climbing access to the roof if tall enough, and trees with leaves that grow above the roof can clog roof drains. | Temperature controls prior to, during, and after concrete pours is crucial. When the building is wrapped, access points should only be open when absolutely needed, and should be closed asap. | Understand that every design change has a ripple effect. These can either drive costs up, or down in other areas. For example, if the rooftop equipment is reduced in size, the structural steel should reflect this change. | For projects requiring site plan approval, there should be at least one meeting with both Public Facilities and the Design Review Committee prior to trying to get site plan approval. This allows for questions, comments, and concerns that can then be responded to prior to trying to get approval. |

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| Do not overthink control systems. There is a fine line between smart energy management, and inoperable systems. .I'm not sure there is much value to adding centralized lighting control systems to any building other than for outdoor lighting. I think occupancy sensors for interior spaces serve the same purpose. Occupancy sensors should be set up as vacancy sensors (this mode requires lights to be turned on manually) in classrooms, offices, conference rooms and gathering spaces like auditoriums and cafeterias. | Plantings at the perimeter of the building need to be well thought out. No plantings that attract animals, provide a habitat for animals, or cause a threat to the building or people should be used. Additionally, the plantings need to be able to survive limited watering, snow removal, etc. Think about maintenance, lines of site for foot traffic and automobiles also. don't make landscape design to crazy $$$$$ | Roof inspection and walkthroughs are critical prior to membrane installation. | Never consider value engineering until the cost estimates are reconciled, and a full scope clarification is performed. Taking something out that we want, before we know if there are things in the design adding to the cost that we don't want, is not appropriate. | Joint meetings, when possible, are very useful and minimize design teams time, and thus costs. They also more effectively utilize everyone's time. The use of remote meetings, when allowed, can actually increase community participation, create more efficient meetings, and increase overall efficiency and productiveity by reducung hours of commuting and travel time. |
| All energy investments should be evaluated using life cycle cost analysis. That said, remember that the insulation in your walls will be there for the life of the building. | Before a final site plan is determined, snow removal and snow storage plans must be in place. Things like benches, bollards, raised planters, curbs, islands, etc. must all be looked at with an eye for snow. If you don't make it easy, either standards are reduced, or items get damaged. | Mockups should be used on every project, and should involve the commissioning agent, design team, and all impacted trades. The construction team should be clear on air sealing expectations. And Application and installation. | Review all narratives in great detail before they go to the cost estimators. | Consider meeting with abutters on location. It tends to much more productive when you meet with residents in an informal setting. This has proven very useful on many occasions. Relationships with retail & residential Neighbors important. |

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| Energy modeling should be done throughout the project, but it is extremely important to set energy performance expectations early, and model from the beginning. Important objectives such as air sealing/air changes used in the modelling should be clearly understood by designers and the construction team so that they can be properly executed. | Before a final site plan is determined, landscaping and grass cutting plans must be established. If you don't make it easy, either standards are reduced, or items get damaged. The sidewalks should be eight feet wide where possible so that the plows don’t tear up the landscaping on either side. | The HVAC system flush should be done with the construction filters in, and it should be confirmed that normal pleated filters are installed prior to turnover. | Be very sensitive to words like custom, automated, and operable. Often times there are more creative ways to achieve the same end product with a different approach. | Provide routine updates to the CC on the status of change orders and contingencies. This will make funding transfer requests much easier, as they already know what's coming. |
| Energy modeling needs to be done based on the normal school day, and the actual hours of operation. The normal school day allows for comparison to benchmarks, and the actual operation allows for budgeting and tracking. It is important to monitor post-occupancy energy use and envelope testing in order to evaluate original model and assumptions made. Often modelers do not get building data feedback, | Designers team and their consultants must put themselves in the shoes of the people who maintain the building and grounds. Make sure there's room to turn a wrench on a trap. Make sure there is clearance to open filter access doors. Make sure there are slop sinks in appropriate locations. Make sure there are outlets in hallways for cleaning equipment. Just use common sense, and if you're not sure please ask. | Extreme care should be taken to temperature and humidity controls and monitoring during wood floor acclimation. Follow designers and Manufacturers spec recommendations ,,,,, | Storefront is very expensive. Consider wall systems with punched windows to achieve a similar design at a fraction of the cost. However delivery schedules of manufactured window units may be longer than delivery of components for on-site built storefront. These factors need to be evaluated as well. | The most important part of a public forum is to provide them the opportunity to speak and ask questions. The presentation should be short enough to ensure we provide this opportunity. |
| Solar orientation is very important early in the design, as this has serious impacts on lighting, heating/cooling loads, and potential for solar pv. | In areas where caustic or acidic chemicals are used, ensure all exposed materials can stand up to the environment. Along with surrounding structures and finishes | Glazed stone products should be inspected carefully upon receipt. They tend to be damaged during delivery. | Glass in the envelope is expensive, and less efficient than the wall system. Do not use more than is needed, and there must be value added in every case. | When reviewing exterior building materials, samples should be provided for display. Size of sample also. |

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| Deconfliction of the roof plan is important for solar pv. The electrical plan should include conduit runs from the roof to the electrical room for solar readiness. | Make sure rooftop equipment is not set too high on the curb. If the workers can't reach the access handles, they are less likely to maintain the equipment, and are more likely to get hurt while doing so. | We need to follow our noise ordinance, but we also need to make sure that trucks and other equipment is not idling outside the site waiting for the gates to open. They can stage at truck stops if needed. | Be sensitive to windows in gyms. They are often covered up once the building is operational. If glass is desired, translucent panels are a good alternative when trying to break up the massing. | Street views with and without trees are the most valuable slide in a presentation. What people will really see from their perspective is very important. |
| The lights in the building need to be able to be turned off when not in use. This can be easily accomplished with the use of occupancy sensors and vacancy sensors rather than a central control system. And keep it simple Ceiling mounted, | Do not paint hand rails. These get scratched and look really bad. All exterior hand rails should be hot dipped galvanized and no painted. | Major deliveries should be coordinated with Police and should be communicated out to the public. The neighborhood should receive news letters via e-mail and also in there mail box. Deliveries should be part of site safety and logistics plan | Limit the number of different exterior building materials. Each transition adds a complexity as well as cost. The rain screen should be comforting to the surrounding structures as well as the eye, simple application and less deviations help $$$$ | Review the General Conditions and General Requirements carefully. The CM can bury a ton of money in this. Every position being carried needs to be value added, has to have realistic timelines, and their % time on the project needs to be on point. Make sure that the CM knows you will be watching to make sure we get every hour from every person we're paying for. |
| Occupancy sensors should shut the lights off when the space is not in use, but the lights should have to be manually turned on. Often times the lights turn on when they really aren't needed. (I think that this should apply to offices, classrooms and assembly areas but not to hallways and restrooms.) | Use manual equipment when possible and appropriate. It is more reliable and less expensive to maintain. | You can never communicate too much to the public. People will put up with major inconveniences if they know about them in advance, and no when it will end. | Be very careful when specifying proprietary components. This will add cost to the project. | The designer is required by contract to design to our budget. They need to expend their time and resources to redesign as needed to meet the mark. |
| Variable speed drives need to be tied into the refrigerant and hot water control valves. If an AHU is driven down, the valves, and then boilers/chillers should follow suit. | Epoxy floors in bathrooms, quarry tile in kitchens, and no wax floor products like linoleum in hallways and classrooms. Good value low maintenance surfaces can be a key in long term maintenance $$$$ | When you tell the public you will, or will not, do something. Follow through. It only takes one time to break their trust. | Never trust the manufacturer's rep when they quote costs. They will tell you a much lower cost to get you to specify their product, only to find out that the market dictates exponentially higher costs. | During cost estimating, it is important to push back on the estimators that tell you what something should cost, versus what the market bears. |

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| Equipment start times should be staggered greater than 15 minutes prior to turning over a building. I think that where we use VRF and heat pump systems there will be less opportunity for set backs and shut downs because of the slow recovery time for heating and cooling. | Specify ceiling systems like act for ease of maintenance. There are other ceiling systems that are pretty, but make access very difficult. The size off the ATC panels should not exceed 2' x 4'. | Ensure that off-hour phones numbers are posted for residents to call in case of emergency or concerns. Make sure that the number that is posted actually works. | Make sure you specify products that have "or equals" There may be three contractors who can install the same product, but this does not mean your getting competitive pricing. If we use equipment and lighting products that comply with the utilities' energy efficiency program standards as a minimum then we will be assured of getting high quality equipment that is efficient and will be eligible for rebates. | Create a project environment where creative problem solving is encouraged. Never discourage anyone from speaking up. Many crazy ideas have turned out to be brilliant solutions. No such thing as stupid question or solution! |
| Solar PV systems impact the heating and cooling loads of buildings. This should be factored in when sizing mechanical systems. | Glass should never be carried to floor height to prevent damage. | Dust control is extremely important. A plan must be in place ahead of time, and sufficient water must be available, and delivered. Again part of site safety & logistics plan! | Be very careful when specifying Trane or Mcquay HVAC equipment. They will tell you that it is compatible with BMS software, but it rarely is, and it rarely works correctly. | Establish a personal connection with the neighborhood. Treat the job site like your home, and the abutters like your own neighbors. Walk the job site perimeter and the neighborhood daily. Provide community updates at regular intervals. Advise on upcoming activities, adjustments in work hours or days, etc. Most people just want to know what to expect in advance. Let Abutters see you, it develops a comfort level even though you may not speak frequently. |

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| Kitchen hood exhaust fans should be variable speed. These not only use a ton of electricity, they also remove vast quantities of treated air. We should look into getting exhaust hoods with heat exchangers if they are available. | Crushed stone should never be placed at the perimeter of buildings. This leads to broken windows during landscaping | A city employee should be on site every day to provide adequate oversight for all major projects. | Engineers will always overdesign their systems. Push back on the sizing of generators, boilers, hot water tanks, electrical services, chillers, ahu's, etc. Make them justify these components. Not only will smaller equipment cost less, but they are less expensive to operate, and will simplify design and save money in other areas. | Time is often wasted trying to solve a design or construction issue inside the construction trailer. Get out of the trailer, and go look at the problem. Most people are better problem solvers when they are looking at it in real life, than on paper. |
| If a space is unoccupied, there should be no exhaust or fresh air supply running. This is where the use of EMS is beneficial. Schedules included in the EMS should be carefully reviewed with the correct personnel at commissioning. | North facing overhangs can be problematic for mildew and mold growth. | Any time there are unit prices, such as soils, the city employee needs to watch very carefully the amount of material being removed or provided. These costs can add up fast. | Challenge structural engineers to think outside the box. Their solutions are often not only overdesigned, but they tend to be more complicated than necessary. | Encourage and mentor the youth on the job site. They are the future of the industry. |
| Flow restrictions in both duct and pipe should be minimized as much as possible. Avoid 90 degree bends when possible. | Porcelain tile stands up better than wood veneer. This should be at least 4 feet high in the hallways. | Trench boxes are not a suggestion. When required, they are not optional. | Market conditions and material costs need to be monitored when considering the escalation to bid number that you carry. | Don't ever be afraid to hit the brakes. It is far better to pause and determine the correct path, than to drive the wrong way for a week. |
| Pump sizing should be reduced as much as possible as they use a great deal of electricity. | The broadcast of epoxy floors needs to be rough enough to prevent slipping, but not so rough that it can't be cleaned. | Utility companies take forever to do anything. Plan accordingly. City should keep an updated contact list of all utility companies contacts for emergencies, construction and maintenance. | Establish early who is authorized to make design decisions and changes. For example, a teacher can make a request, but the decision to include something in the design needs to come from the project team. | The CM contingency is a misnomer. It may be under the control of the CM, but we have to authorize the use of these funds, and contrary to their belief, the money belongs to the taxpayers. ALL contingencies belong to tax payers and use of these contingencies are made well aware of by CM / GC. They want it! |

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| There should be no lights without lighting controls. And a simple lighting control system that satisfies energy code. | Chilled water fountains are not necessary, waste electricity, and are more expensive to maintain. Filters are not necessary either. | Vibration monitoring and existing condition surveys are important depending on the project and proximity to other structures. Historically vibration motoring has saved the city in potential claims. | When reviewing the design with public safety, make sure Police, Fire, and the user group are all in the same room. There can be opposing agendas, and this step is necessary to prevent redesign. Meeting minutes should be taken and issued. When construction actually happens one or two years later, these can then be referred to remind everyone what was agreed upon. | All parties should agree to a submittal turnaround timeframe at the beginning of a project. If this starts to slip, correct it quickly or you can be hit with delays from subcontractors. |
| You can design the best wall system, but if it's not installed properly, all of your work will be for nothing. Great care needs to be taken before the walls and ceilings are closed up to make sure there are no breaks in your thermal envelope. | Solar panel footprints should be marked so that snow removal can occur as needed without damaging the panels. We would not remove snow from panels. Maybe you are referring to lightening roofs due to a heavy snow occurrence? | If behind in schedule, a plan must be developed and implemented immediately to get back on track. Do not wait until the end of the job to try and make up the time. | Ensure the Design Review Committee is involved early and often. It also proves useful to invite them to working group meetings. | During the creation of the IFB, the OPM should be more involved in the overall process. Both the Designer and the OPM should be reviewing the City front end of the IFB. This appears to be an issue with first time designers and OPM's. The City prepares what it feels is the proper template for the particular Project but it the responsibility of both the Designer and OPM to ensure that the template sent to them, for example has the correct Bid dates, Filed Sub Bidders, the correct number of Alternates, if any are listed, Unit Prices shown, if required, as well as ensure the proper documents along with the technical specification are made a part of the IFB. |

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| It would be helpful to know when electric and gas accounts are cancelled and when new accounts are assigned to the City during the construction process. This is to maintain our database and for our electric and gas supply contracts. | Pavers should not be used where plowing occurs. | Pay close attention to the number of tradespeople on the job. This can be a precursor to falling behind on specific trades. Find out early on what software CM / GC uses to monitor Onsite staff as well as all documents. | Involve the community early in the design process. Not only is community feedback important, it's critical to squash rumors before they get out of hand. | Construction Drawings and Specifications should be reviewed by multiple members of the Design Team including not limited to the Architect, OPM, various City Departments/Agencies and most importantly the Public Buildings Department to ensure their accuracy and completeness prior to being sent for review by the DRC and more importantly before placing them in the IFB for the Project. |
| Have PB Project Managers take a lead role in setting up and conducting inspections by utilities for project rebates for new construction. | Stone dust should be used in lieu of concrete where snow removal does not occur. | Trades that do not work M-F, are not entitled to change orders for overtime to catch up. | If the project requires review by the Conservation Commission, and the commission is asking for mitigation, make sure there were actual adverse impacts to mitigate. | The IFB must clearly state the milestone date(s) that the Contractor is required to make and identify the consequenses of missed milestones. Construction is fluid and things happen, but the Baseline Schedule milestones must be clear as the basis of bidding and award. |
| While other types of energy efficient equipment should always be explored, the initial cost of installation plus cost of annual maintenance of such equipment should be taken into consideration when deciding on new technology. Funding and the proper expertise for this maintenance is not always available to the City. | Exposed steel beams need to be designed in a way to prevent bird nesting. | Analyzing change order credits is just as important as change order adds. Guarantee that contractors will ask for more than they deserve, and offer back less than what we deserve. | Make sure you are coordinating building projects with DPW and Parks and Rec. For example, DPW should not pave a street before a large project starts. We will likely need to tear it up for utility work. | Should there be a sudden need to put an active project on hold for an extended period of time, it is critical that documents to date be printed and archived electronically. This will aid in understanding what obligations have been completed, where the project left off and should pick up from, and if there are issues or items that need to be revisided. Inevidably there will be an overwhelming desire to re-start quickly. |

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| | Asphalt curbing should be avoided at all costs. It saves some money up front, but it will not last and will cost more in the long run. | Do not accept an inferior finished product. If it does not meet the design intent, or quality standards. Make the contractor make it right on their dime. | It's never too early to do the site survey. This info can completely reshape a project. | |
| | Fencing should not be too close to sidewalks, roadways, or parking lots. Snow gets pushed against the fence causing damage. | Do not wait to perform the punch list until the end of the job. Punch lists should be made, and items addressed, as they arise. Schedule, Punchlists, Commissioning etc. start in the beginning of project. | Perform condition surveys of adjacent properties prior to large projects. If this is not done ahead of time, there is no way to prove that the project did not cause the damage in question. | |
| | Small narrow strips of grass should be avoided. These can not be done with mowers, and therefore do not get adequate landscaping. | Do not install ceilings until all punchlist items above the ceilings are complete. Engineers should be aware of access for filter changing. | Avoid unit prices and allowances when possible. If needed, ensure the specs are crystal clear. This is an area where large change orders are likely, and allowances tend to get eaten up. | |
| | Pedestrians will take the path of least resistance. If walkways are not direct routes, people will not use them. | Make sure the construction management plan addresses site distribution and traffic issues during the project. This plan needs to be reviewed with public safety, so that they can weigh in and plan their resources accordingly . | When possible, complete hazmat work like oil tank removal ahead of time. The markup in these areas is massive, and the city can, and has, saved hundreds of thousands of dollars by doing it ourselves. | |
| | Fixed trash barrels get emptied by trucks that drive right up to the barrels. Either put the barrels close to a paved surface, or be prepared for damage to site amenities. | Never spend money you don't have. In order to ensure this does not happen, replenish the Mayor's contingency as frequently as possible. | The parameters for traffic studies are critical. The study needs to be broad enough, and data collection needs to be taken at appropriate times. | |

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| | Slab on grade is always preferred. Any structure below grade is not only more expensive on the front end, but it is more likely to have environmental issues and costs. | If site excavation requires undermining of utilities like a duct bank, they must be fully supported to prevent collapse. | Even though the traffic work is separate from the project, it is viewed by the general public as one and the same. Therefore, this work must be tracked just as closely to ensure it meets the project schedule. | |
| | Crank windows are not preferred. They do not stand up over time. | Contractors will typically seek change orders for winter conditions. This needs to be analyzed carefully. If they are responsible for being behind schedule, and then create the winter condition problem, then we don't owe them anything. Additionally, snow removal is not unexpected for a job that occurs during the winter. They will often ask for money for this, but it should not be awarded unless extreme conditions occur. If it is known that the project is going to happen in the winter, winter conditions should be mentioned in the specs to avoid unexpected change orders. | Site distribution is one of the highest priorities on any project. The goal should be to allow student access to play areas without crossing roads or parking lots when possible. | |
| | Garbage disposals need to have guards to prevent injury and damage. | Monitor the sewer piping installation below grade very carefully. If pipe transitions are not smooth and seamless, the building will experience sewer backups and costly repairs down the road. | Walkability and bikeability are important, so both the traffic work and the site design should take these into consideration. | |

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| | Water fountains should be attached to the building when possible. Free standing fountains are more susceptible to damage from freezing if not properly winterized. | Fall protection is not optional. | Concrete walkways should be 8ft wide. 4ft panels yield large ruts on either side from snow removal, and 6ft panels snap from the weight of the trucks. | |
| | Always run an extra conduit or increase in size for future expansion. | Soil management is extremely important. Care needs to be taken to ensure stockpiles are covered, protected, and not mixed with unsuitable materials. There is a potential for six figure change orders if this is mismanaged. | Roofs need to be designed to be solar ready. This does not require additional steel, but the roof should be designed as clean as possible, and the roof system warranty needs to be compatible with a ballasted pv system. | |
| | Plumbing cleanouts are required every 50 feet. However, where they are placed is very important, and if needed more should be provided. Think of the plumber trying to clear a clogged pipe. | The quality control inspector on any job, should have no other responsibilities. They need to be focused on QC and making sure we are always looking ahead to make sure what we are doing now, will set us up for success down the road. | Stained concrete is more sustainable than painted concrete. | |
| | It is good to have P.B. involved in any ADA retrofit projects and work with the City's office of Disability. | Closely monitor allowances. Contractors like to assume that's their money. | There should be no gates on perimeter emergency access roads. and on dumpster enclosures. | |
| | Project design of materials and equipment should reflect anticipated maintenance in years following warranty period to properly service the equipment. Proper shutoffs for equipment should be installed to allow for easier maintenance as is required. | Tree protection needs to be very carefully thought out, and executed. Roots need to be kept buried, wet, and protected. Be realistic with what can be done. If the opportunity to save more trees presents itself during construction, take it. Plans can change if it benefits the project. | Consider reducing the number of cameras inside the building, even if it means increasing the resolution. You can achieve the same level of coverage for a much smaller cost. | |
| | | If possible, use design-build approach for small fast track projects. | A single main entry is preferred. This improves security and operations. | |

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| | | Roofing Manufacturer contractor installation oversight appears to be lacking for our membrane roofing system installations as numerous leaks are occurring that are related to poor installation | Exterior lighting can comply with the light ordinance, but still be a nuisance to abutters. Shrouding the lights when possible is preferred. | |
| | Make sure if the specifications call for attic stock that it is actually provided and signed for. | A construction schedule should be submitted and approved by the architect and OPM at the onset of the project. Updates should be submitted monthly. Resumes for the On Site Superintendent and other contractor personnel should be reviewed prior to that person being assigned to work on our project. | Asphalt curbing should not be specified. It yields a savings up front, but it will not hold up, and will cost more down the road. | |
| | Make sure that the water quality control structures are maintained by DPW. | Windows should and need to be tested for air infiltration and water leaks. | Buffering should always be planned for where cars are facing abutters. Headlights are a nuisance. | |
| | | Site contractors will try to get away with backfilling in two foot lifts if we let them. We need to watch them and remind them what the specifications call for. | When possible, buses and parents should not mix. The bus loop should be separate from the parent drop off. | |
| | | All materials that arrive on the project should be check against the approved submittal. | Do not specify flooring and ceiling systems where they aren't needed. Storage closets, utility rooms, etc. do not need these finishes. | |
| | | | When possible, use the building contours to control acoustics from rooftop equipment. This will reduce the need for acoustic screens which are expensive. | |

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| | | | Line of site at the main entry is important to efficient operations. Make sure that the administrative staff can easily see the main entrance. | |
| | | | Make sure that athletic outdoor areas are designed in a way that prevents negative impacts to abutters via foul balls or other flying objects. | |
| | | | Make sure that the full scope of work has been identified before starting design. Scope creep can bust a budget very quickly. | |
| | | | Slab moisture mitigation should not be included in the base bid. If needed, it should be priced out and paid for out of contingency. | |
| | | | Do not specify water based wood floor finish. It does not bond as well. Low voc oil based finish should be specified whenever possible. | |
| | | | 3 story buildings are appx 10% more energy efficient, less costly to build, and better utilize urban sites, than single or 2 story buildings. | |
| | | | For small buildings, consider prefab structures. They are much less expensive and their quality has improved significantly over the years. | |

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| | | | City water flow tests should be performed early in the design phase. This will determine what fire equipment is needed. Cameraing sewage lines and Fire protection lines also. | |
| | | | AED devices should be hard wired into the building fire alarm panel. This will ensure that dispatch is notified when an AED is used. | |
| | | | Equipment must be specified and installed in new buildings to ensure police and fire radios work. | |
| | | | Whenever traffic improvements are made around a project, we must be sensitive to the ripple effect it has on the broader community. | |
| | | | Do not assume other departments who review the plans, understand what they're looking at. If they don't fully understand the plans, they will likely require something different during construction, thereby leading to a change order. | |
| | | | Do everything you can to verify all existing conditions. If there are items that are either unknown, or if plans do not match actual conditions, expect significant change orders. | |

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| | | | CMU is much more durable than drywall, but it does not need to be carried up to the ceiling. Use durable wall products where wear is expected. Above that, drywall is perfectly acceptable. | |
| | | | Be very sensitive to acoustics in the cafeteria and gym. If not designed correctly, these spaces become very problematic. | |
| | | | When specifying floor tile, thin mudset is perfectly acceptable. Thick just costs more with little to no added value for our applications. | |
| | | | If the project calls for irrigation, consider both rain water harvesting, as well as irrigation wells, to help reduce long term costs. | |
| | | | Exterior emergency generators should be sited in locations that minimize the impact to abutters. They are loud when operating. | |
| | | | Skylights should be avoided. They leak over time, and are a hazard when navigating roofs in the winter. | |
| | | | The landscaping design should be carefully analyzed. There are often ways to achieve a similar outcome for a fraction of the cost. | |
| | | | Security cameras are great, but if there is no light in the area they are covering, they are useless. | |

# Project Lessons Learned Update

| Energy | Maintenance | Construction | Design | Process |
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| | | | | |
| | | | Renovation that is performed to the same standard as new construction is significantly more expensive. | |
| | | | Make sure the correct scope of work is assigned to the correct trade. Many trades can perform a variety of work elements, but their costs can vary | |
| | | | Make sure all as built building plans, roof and equipment warrantees, and operation and maintenance manuals are put in the Public Buildings file at the end of the project. It seems that this should be done by our Project Managers. | |
| | | | Make sure that the designers are applying AAB and ADA codes for accessibility whichever is stricter. | |
| | | | Do more in-house design for small projects which can save on architects fees. | |
| | | | Project design of materials and equipment should reflect anticipated maintenance in years following warranty period to allow the proper service to the equipment. | |

# Project Lessons Learned Update



| Energy | Maintenance | Construction | Design | Process |
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| | | | | |
| | | | The Sarnafil membrane roofing system, as manufactured by Sika, that has been used on the past 5 Major Projects has not held up well as we have experienced over 35 leaks at the various Projects since the original installations. As stated in an earlier Lessons Learned note, installation oversight is not a strong suit of this company. Working with Sika on inspections prior to Solar Panel Installations and on Post Installation has been a challenge. They no longer do Pre-Solar Installation Inspections which can be problematic after these installations are completed. An alternative system should be designed to determine if the City can switch to a roofing system that is not as problematic as the | |

# Project Lessons Learned Update

| Energy | Maintenance | Construction | Design | Process |
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| | | | | |
| | | | Roofing Systems should be designed to withstand the type of foot traffic / potential additional equipment installations. Membrane roofing while much less expensive than built up systems, do not stand up well to heavy foot traffic and Solar Panel installation. Additional walkway pads should ne mandatory. Stronger verbiage should be in the specifications outlining the apparent lack of oversight by both the GC/CM site superintendents as well as manufacturer during the roof installation. | |
| | | | Any roof design should incorporate the collection of all water to an onsite water treatment system from the roof, whether an interior or exterior roof drainage system is being used. The idea is to keep the water flowing and not standing. Avoiding direct tie in to an existing storm water street system should be discouraged due to the potential over charging of the existing storm system. | |

# Project Lessons Learned Update



| Energy | Maintenance | Construction | Design | Process |
|---|---|---|---|---|
| | | | | |
| | | | Construction Drawings and Specifications should be reviewed by multiple members of the Design Team including not limited to the Architect, OPM, various City Departments/Agencies and most importantly the Public Buildings Department to ensure their accuracy and completeness prior to being sent for review by the DRC and more importantly before placing them in the IFB for the Project. | |
| | | | A minimum of a Two year contractor warranty on all workmanship and materials/equipment should be made mandatory in the project specification. Extended warranties/service on equipment such as HVAC and Elevators with the time line stated in the specifications, such service to be routine monthly maintenance and in the case of an elevator, the first State Re-inspection, a year after the initial State Inspection. | |