

HOSPITAL EXPANSION SOLUTIONS FOR LEADING HEALTHCARE FACILITIES



**McLaren
Replacement
Hospital**

**Lansing,
Michigan**

SYNERGY CONSULTING ENGINEERS

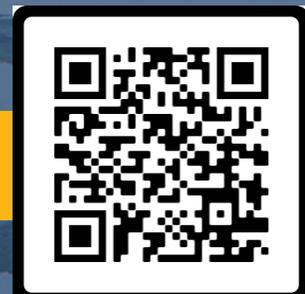




TABLE OF CONTENTS

ABSTRACT	03
HIGHLIGHTS	03
MCLAREN CASE STUDY	04
OWNER'S PROJECT REQUIREMENTS	06
COMMISSIONING	09
ADVANCED DATA ANALYTICS + FAULT DETECTION	14
CONCLUSION	20



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HIGHLIGHTS

- Forward-thinking hospital owners achieve new building optimization by leveraging data analytics and MBCx
- The Owner's Project Requirements (OPR) document creates the opportunity for discussion that aids in steering the project in the right direction, with the agreed-upon requirements during the pre-design phase, and drives accountability for the entire project team
- Synergy has supported other healthcare organizations in navigating the choppy waters of building a new hospital from design through operations.

ABSTRACT

In March of 2022 McLaren Greater Lansing Hospital opened its doors to the community. The project, which broke ground in 2018, was a \$600 million health care campus located on the Michigan State University campus in Lansing, Michigan. McLaren partnered with Synergy Consulting Engineers as their Commissioning (Cx) Agent to achieve their goal of creating a safe and efficient facility.

As the owner's advocate, Synergy approached McLaren with an innovative form of Monitoring-Based Commissioning (MBCx) that would not only provide them with an unprecedented Cx during design and construction but would also set up the campus and Facility Management team for proactive optimization year after year.

**McLaren's new \$600
Million Healthcare
campus in Lansing,
Michigan.**

MCLAREN GREATER LANSING EXPANSION HOSPITAL

McLaren Health Care in Lansing, Michigan was outgrowing their existing facilities and required an innovative solution. Their existing hospitals underwent several renovations through the years and were located in older neighborhoods without easy access for patients. It was becoming more challenging to provide a high quality of care with rapidly aging facilities. Their administration decided a new hospital was needed to better serve the people in the community.

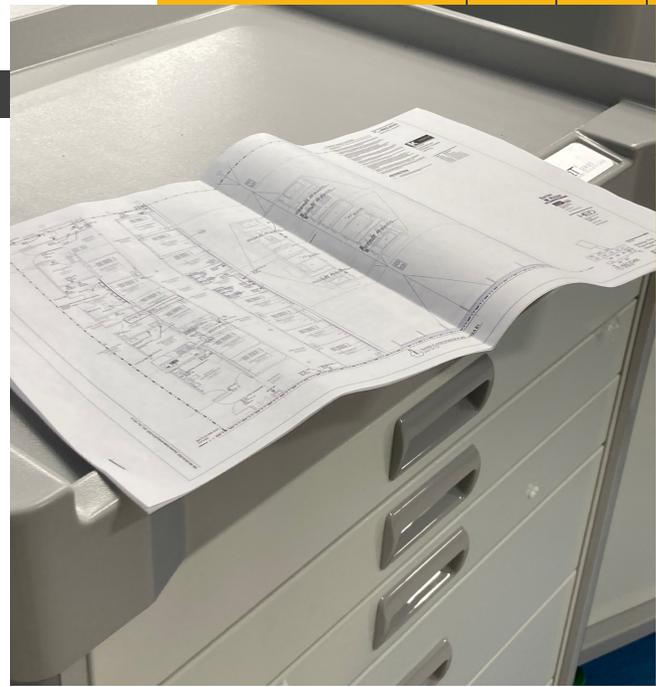
Their new \$600M Health Care Campus located in South Lansing, which partnered academically with Michigan State University, opened in the spring of 2022. The facility provides a long list of services to the community, including a Level III Trauma Center/Emergency Department, Orthopedic and Sports Medicine Institute, comprehensive cardiac programs, medical/surgical units, and state-of-the-art women and children's health services including a modern birthing center. Also located at the healthcare campus is the Karmanos Cancer Institute at McLaren Greater Lansing and Outpatient Care Center. The 562,000 square foot facility combines the functions of their previous Greenlawn and Pennsylvania Avenue campuses.



The collective agreement between the Hospital Owner and the Project Team was to build a facility that not only served the Community with easy freeway access, but also one with cutting-edge technology that would set them up for future growth and success. Building a new hospital requires years of investment before breaking ground. How could they make sure the hospital fulfilled everyone's expectations and requirements? Whose job was it to hold the Project Team accountable to make sure the design intent was met?

In this Case Study, we will outline three services that Synergy provided to McLaren Health during the expansion process:

1. **Owner's Project Requirements (OPR) Development;** Validating project goals and providing accountability through project completion
2. **Commissioning;** Ensuring all MEP assets and systems operate as designed and at optimal performance
3. **Advanced Data Analytics and Fault Detection;** Optimizing proactive facility maintenance for long-term care



With the privilege of coming alongside McLaren's new hospital project, Synergy was able to support their new healthcare facility project from design through operations.

Synergy's Engineering team was brought on board in 2018 to conduct the Owner's Project Requirements (OPR). An OPR, as outlined out by ASHRAE, is a living document that "details the functional requirements of a project and the expectations of how it will be used and operated". This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, owner's directives, and supporting information.



OWNER'S PROJECT REQUIREMENTS (OPR) DEVELOPMENT

Validating project goals and providing
accountability through project completion

It can be a daunting task for stakeholders to combine their facilities, continue their day jobs, and build a new hospital. With McLaren combining their Penn and Greenlawn campuses, they needed support to ensure all stakeholders, contractors, and designers were rowing in the same direction.

Kramer Management, the Owner's Representative on the project, had previous experience working through the Owner's Project Requirements (OPR) process with Synergy. As advocates of the OPR, Kramer understood the value it could bring to McLaren. An OPR acknowledges everyone's expectations at the beginning of the project and ensures accountability through to the end of a project. The OPR process helps bridge the gap from the Owner to the Design Team, and ultimately from the Owner to the Construction Team.



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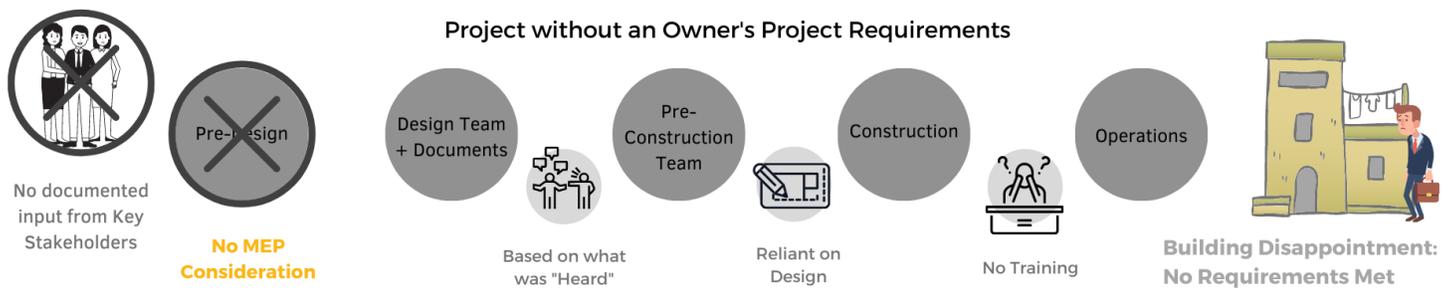


Other healthcare clients with hospital expansion projects have relied on Synergy's OPR process to guide them through building new facilities. The OPR is a dynamic document that is updated, reviewed, and revised throughout the life of the project. Previously, this exercise would be completed over several days in lengthy and time-consuming workshops. Synergy simplified the process by collecting information from all stakeholders through a series of online surveys. Utilizing online surveys allow all stakeholders to lend their opinions and goals about the project in their spare time with open-ended questions, such as:

- How can we make this facility more sustainable?
- What occurred on previous projects that we should look to avoid?
- What is your definition of a successful project?



Synergy's team analyzes and organizes the data in order to narrow down the client's primary objectives for the project. With this project-specific data, Synergy sent out a secondary survey to McLaren with their specific pain-points and goals and asked the stakeholders to rank from 1 to 5 what was most/least important to them. Gathering the input from McLaren's stakeholders was imperative to the success of the project. Rather than relying on what was assumed, spoken in a meeting, or mentioned on site, the OPR holds the agreed upon benchmarks for a rewarding project.



Key Stakeholders

- Facility
- Admin
- Users
- Design
- Tech
- And more



Project with an Owner's Project Requirements



In any successful building expansion project, the engineers and architects work shoulder-to-shoulder with the contractors. Utilizing the OPR document creates opportunity for discussion that aids in steering the project in the right direction, with the agreed-upon requirements during the pre-design phase.



COMMISSIONING

Ensuring all MEP assets and systems operate as designed and at optimal performance

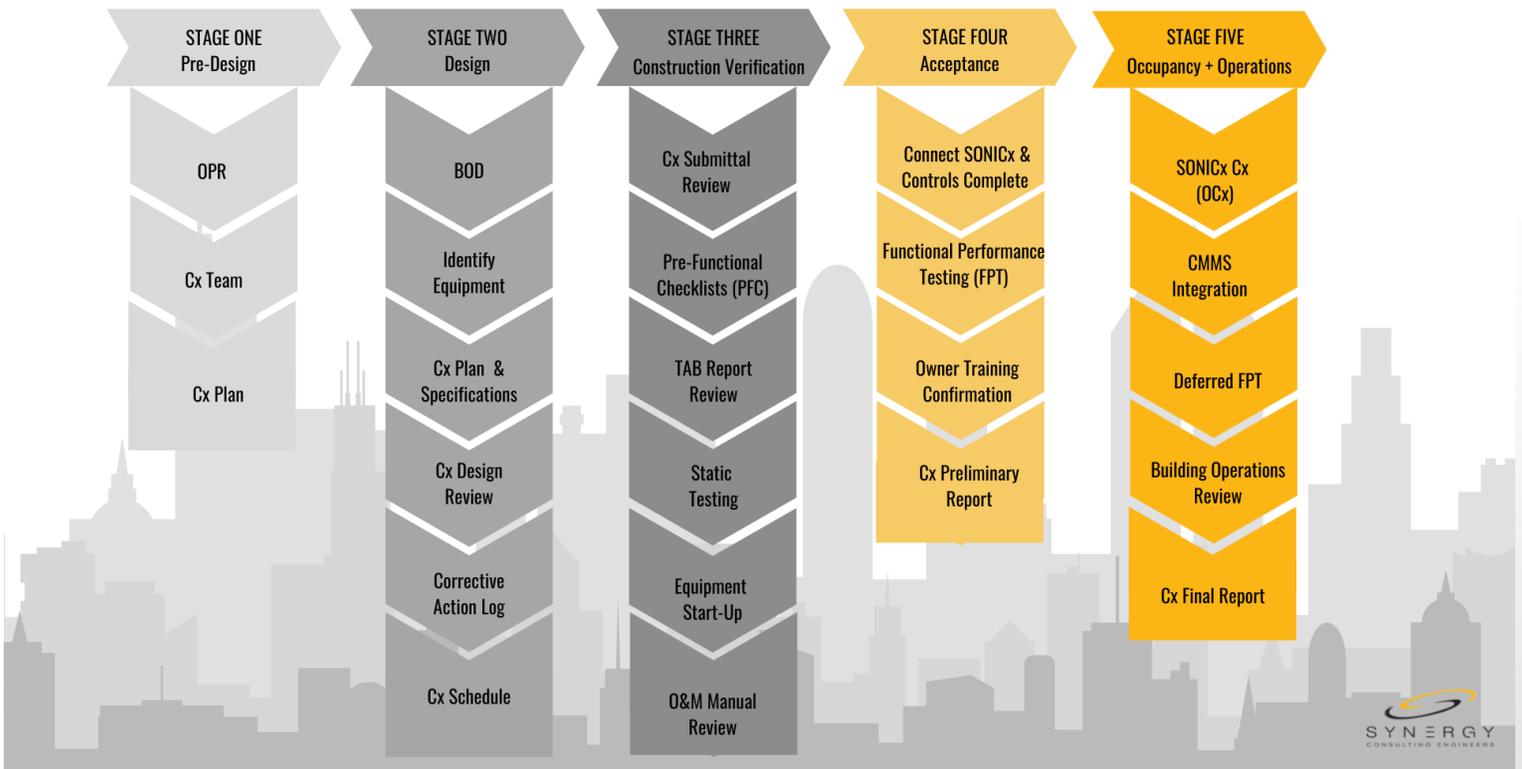
Building a new hospital is not something many people do in their lifetime. With such a tremendous endeavor, Synergy was brought on to conduct the Commissioning (Cx) during the construction phase and to perform Monitoring-Based Commissioning (MBCx) upon completion during the Occupancy and Operations phase. Commissioning, as part of the OPR process, equipped McLaren to clearly align their goals for equipment efficiency and optimization. Synergy has supported other healthcare organizations in navigating the choppy waters of building a new hospital from design through operations.



As the Owner's Representative, Synergy is the eyes and ears during the construction phase to make sure the OPR is met

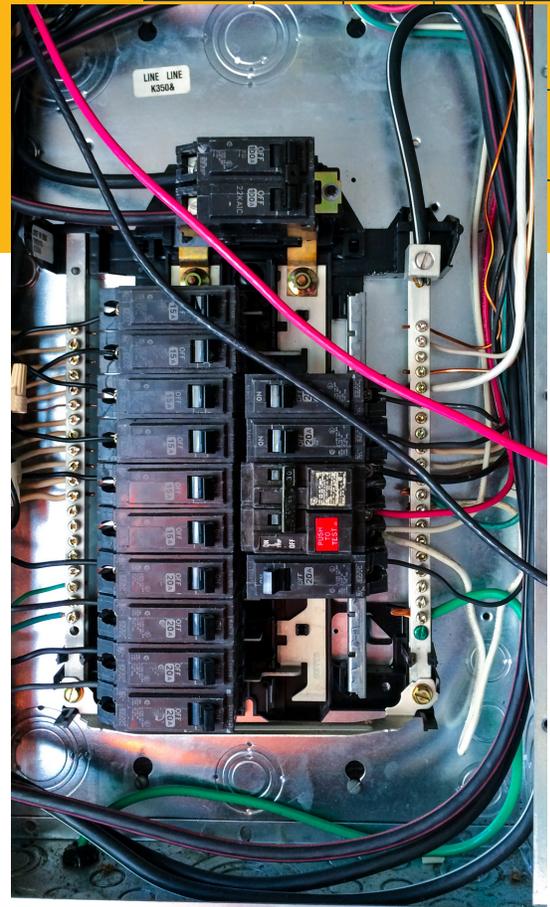
Total Building Commissioning (Cx) is a process that keeps facilities under optimal operating conditions by conducting a series of predefined metrics, and making necessary corrections, to all building mechanical and electrical assets.

Synergy Engineers Commissioning Process



Rather than simply assuming everything is installed per specifications, Commissioning ensures installed equipment matches drawing schedules and specifications. As the Owner’s Representative, Synergy is the eyes and ears during the construction phase to make sure the OPR is met. Synergy was able to incorporate ground-breaking Facility Intelligence with the engineering application of Monitoring-Based Commissioning (MBCx). By utilizing MBCx, McLaren was equipped with a customized dashboard encompassing comprehensive data analytics for the new hospital’s mechanical and electrical assets.

The Commissioning Construction Verification phase begins with a Cx Kick-Off Meeting followed by Submittal Reviews, Checklists, Start-Up Reports, and Field Observation Reports. Synergy spearheaded communication with a Gantt chart that outlined each phase, duration, and deadlines so the construction team and engineering teams had aligned expectations and timelines. The Gantt chart also tracked the installation and completion of all MEP equipment and some of the major medical equipment. This was utilized by all, including the general contractor and helped drive the deadlines and hold all Project Teams accountable. Without a clearly communicated schedule, the engineers would have scheduled their testing around the general contractor's schedule which would not have been as efficient and prone to scheduling conflicts.



In order to remove guesswork regarding project schedule, Synergy conducted consistent progress meetings. Synergy strives to be solution-focused in the field and work alongside the construction team, helping solve problems together, and not hindering their progress.

This unique process allowed Synergy to perform on-site functional performance testing on the primary equipment while utilizing analytics to reveal anything that might have been missed by the naked eye. In essence, functional testing provides a snapshot while data analytics records the long-frame video. Functional testing reveals the large problems while data analytics fine-tunes the small problems with predictive fault detection. (More details regarding data analytics in the next section).

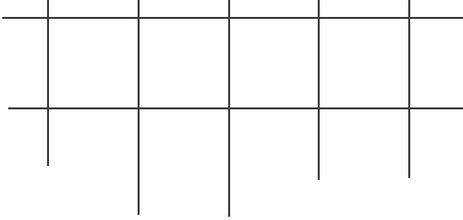


Functional testing reveals the large problems while data analytics fine-tunes the small problems with predictive fault detection.

Some Commissioning Agents provide a simple report that tends to communicate their own expertise while outlining the client's failings within the project scope. Synergy rejects this type of Commissioning and makes proactive efforts to be onsite, working alongside the Project Teams, so the deliverables remain at the highest quality through occupancy. This is especially true with new construction; with brand-new equipment, there is an assumption that everything will work perfectly, but this is not always the case.

Here are a few of the issues revealed during the Commissioning Process:

- During the functional testing, Synergy found gaps and failures in some major HVAC systems. The new state-of-the-art magnetic bearing-based chiller plant took a long time to dial in. Through much testing, control point issues were revealed and addressed.
- The Air Handling Units (AHUs) were tripping in the winter. The freeze pumps were recycling too much of the water and cooling it. If this was not caught early on, and the cooling coil was allowed to freeze, all AHUs would've frozen eventually, requiring expensive and unplanned repairs.
- During the first hot day of the year, the chiller was not staging the way it was supposed to stage. Synergy reviewed the Sequence of Operations (SOO) and suggested modifications so the equipment would operate correctly. The SOO was modified and tested multiple times until the equipment was working properly.
- The maintenance staff were trained but had not had the opportunity to be hands-on with the equipment. As the Cx agent, Synergy stays with the project through the warranty phase to assist with training.
- In addition to some of the major systems not working well, the pressurization of the building was also not where it needed to be. The dampers and controls required attention in order to get the pressurization and critical spaces to the correct levels.



All these issues, along with 784 others, were caught early on so minor corrections were able to be made before they turned into much larger and more expensive problems.

The groundbreaking for this project was in 2019 but was shut down with the outbreak of the COVID-19 global pandemic. The shutdown obviously had a large effect on the construction progress and threatened the timeline. In order to continue driving toward the goal of opening in 2022, the construction teams fabricated things off-site. The pre-fabrication strategy saved McLaren time and money.

Throughout the occupancy phase, hospital staff were beginning to move in during testing. Controls have become more sophisticated and construction schedules don't allow for testing prior to moving in, Synergy worked around the staff in order to perform testing on air handlers. Synergy's Ongoing Intelligent Commissioning, SONICx (pronounced sah-nicks), was used as a beneficial tool during testing and commissioning by continually analyzing and investigating all building operational information. As a Monitoring-Based Commissioning (MBCx) tool, SONICx collects and translates all points of data and converts it into consumable and actionable intelligence. SONICx reveals immediate clarity on asset discrepancies rather than relying on the traditional "point in time" commissioning.



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DATA ANALYTICS AND FAULT DETECTION

Optimizing proactive facility maintenance for long-term care

With traditional Commissioning (Cx) approaches, only a percentage of the facility's systems and equipment are functionally tested; however, those tests typically only happen at a single point in time during the construction process. With Synergy's technology-driven approach to Cx, which includes professional engineering and integration expertise combined with Automated Fault Detection & Diagnostics and Reporting (AFDDR), McLaren was able to

test and monitor all systems and equipment consistently throughout the construction process and into the acceptance phase. This unique approach to Cx allowed McLaren to verify the intent of the original design and confirm it was performing as designed. Synergy's technology also empowered the McLaren teams to diagnose and fix issues in real time before they become urgent and expensive problems later in the construction and acceptance phases.





With Monitoring Based Commissioning (MBCx) connected throughout McLaren's infrastructure, systems, and equipment will continue to be monitored and trended. The MBCx function will be performed yearly to keep the campus safe, optimized, and efficient. The McLaren Facility Management team will be empowered with data and root cause analysis to proactively monitor and maintain the facilities while extending the life of all their critical equipment assets. These functions will allow the McLaren team in line with their mantra of "Doing What's Best."



When the on-site Commissioning (Cx) functional testing was well underway fine-tuning the primary systems (static testing, duct leakage testing, installation verification, etc), Synergy deployed data analytics which was utilized on the secondary side for predictive fault detection. Establishing analytics on the primary side, aided in "plugging the holes" that are missed with traditional functional testing. Analytics performs continual checks to make sure set points are met and equipment is functioning as it should be. Catching any equipment issues before warranty expiration is vital to long-term project success. Synergy's Ongoing Intelligent Commissioning, SONICx, provides a comprehensive dashboard for facility teams to manage their buildings with proactive maintenance with root-cause analysis.



SONICx™

Pronounced "sah-nicks"

**Synergy's Ongoing
Intelligent Commissioning**



SONICx empowered the McLaren teams to diagnose and fix issues in real-time before they become urgent and expensive problems later in the construction and acceptance phases.



Before the grand opening, the new hospital was acquiring enough information to create a more complete picture of all building equipment performance. There was sufficient data to support and build confidence in the Operations & Maintenance Team so they could begin to understand where the issues were located. Utilizing technology alongside Commissioning set McLaren Healthcare apart as a progressive client in the building intelligence space.

Patient care, safety, and comfort are the top priorities of any hospital. By utilizing Facility Intelligence, McLaren positioned its future operations for minimal issues with patient complaints of room discomfort. Through SONICx, the comprehensive dashboard keeps a watchful eye on negative pressure rooms and critical care spaces. McLaren's teams will be able to track and manage the spaces that require compliance. This establishes ready compliance for any inspections by the Joint Commission or others.

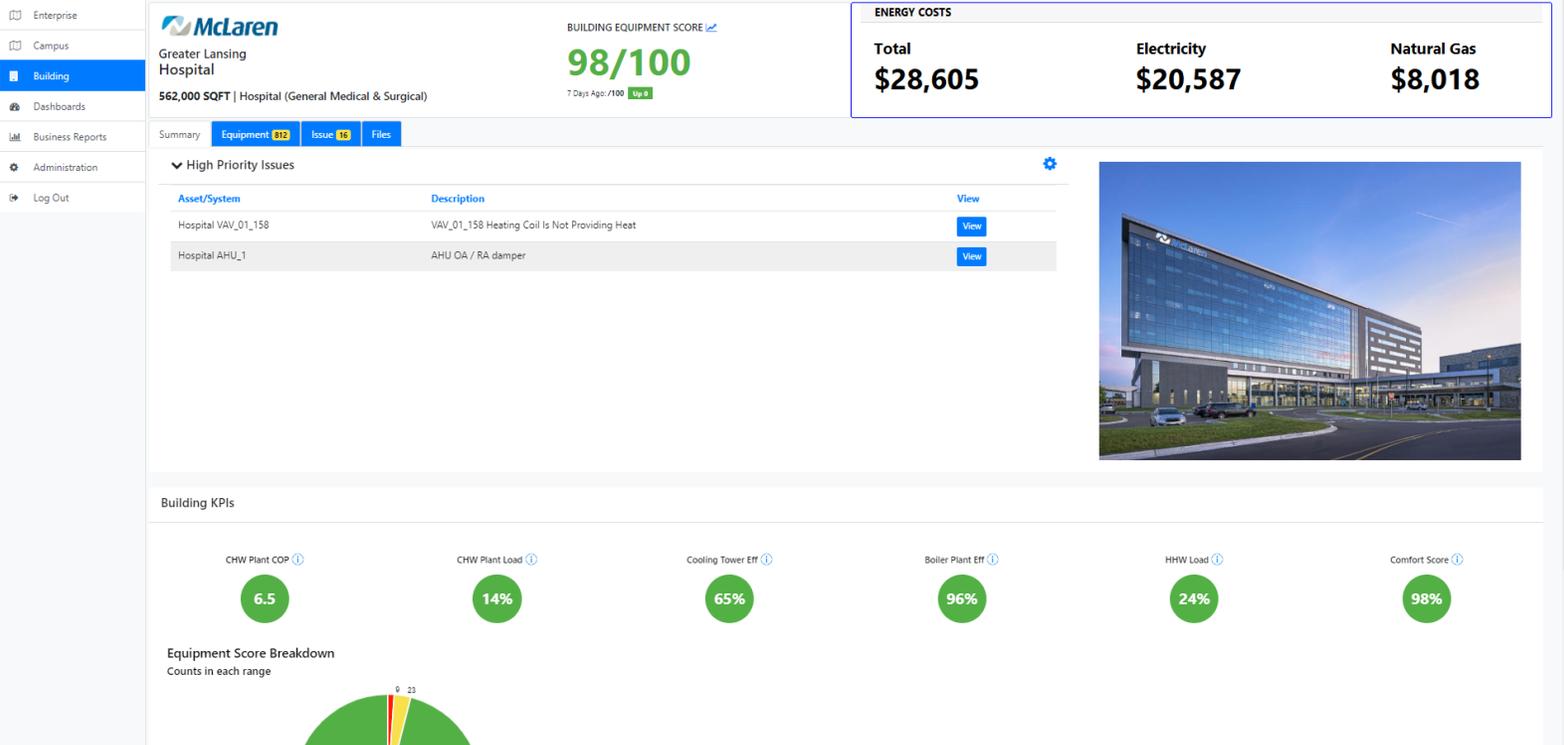




SONICx performed as the guide for McLaren’s facility teams providing live data on all the equipment within the new hospital such as the Chilled Water Plant, the Heating Plant, and Proper Airflow & Pressurization. During the early stages of deployment, Synergy’s team ran reports on the data analytics, then reported the system failings to the Commissioning team on site. The Cx team was then able to review the failed systems and push the corrective action to the appropriate construction team.



Through SONICx, the comprehensive dashboard keeps a watchful eye on negative pressure rooms and critical care spaces.



SONICx also constantly monitors the Hospital’s Chilled Water Plant. At a glance, McLaren can view the capacity and load of the Plant at any given time. This allows them to view the load and ask questions such as: “Is our Chilled Water production matching the demand from the system?” or “Can the Plant handle additional load?” Rather than hoping it can handle additional load or paying for a feasibility study to validate that the infrastructure can handle the renovation, the quick dashboard view confirms capacity capabilities. In short, SONICx allows McLaren to commission the building in an instant.

Managing the energy usage of any facility is an ongoing and daily challenge. With rising utility costs, managing the energy usage is vital to any successful facility. Testing a Chiller Plant will reveal the current conditions within a snapshot of time, but what if it begins to veer off benchmark shortly after testing? Through Monitoring-Based Commissioning, SONICx maintains a digital eye on the benchmarks which allows the facility team to view and take action the moment the Chiller Plant conditions begin to fall below benchmarked conditions.

It is vital to meet and align goals with the facility IT teams before launching data analytics. This will work out any security issues, IP addresses, firewalls, and firewall rules remedied prior to deployment. Synergy did a temporary connection to the hospital's Building Automation System (BAS) during construction, but it did not go to plan. There were roadblocks in connecting to the hospital network with a VPN and several security issues which led to low-quality data being collected. Once the IT issues were resolved, solid data began flowing within the connected building. Collecting data and running analytics empowered the facility teams with actionable information.

Due to difficulty with getting the data connected, training the facility team with the SONICx software was delayed. Ideally, this should occur prior to operational turnover. However, after training was complete, the McLaren facility team now has data to validate the effectiveness of the building, its energy efficiency, and the success of their teams in managing the facility. SONICx gives them hard data to confirm the building efficiency and measurables to provide when repairs and/or new equipment will need to be requested.





CONCLUSION

The McLaren Replacement Hospital project had a tight timeline before the pandemic, but with all teams rowing in the same direction alongside McLaren, the new hospital opened on time. Like any new construction project, everything should be in perfect working conditions, but it takes time for systems to be fully understood, assets to be calibrated to the correct output, and new operations to begin.

Intentionality at the beginning of any project will yield benefits at the end. Leading the project with the OPR aided the new hospital construction by aligning goals and expectations while providing an avenue of accountability. Through Intelligent Commissioning, troublesome HVAC system issues were caught early on and solved well in advance of any critical systems failing.

Synergy's data analytics and fault detection diagnostic software, SONICx, measured how the building performed and suggested strategies for where the systems and assets needed attention. Ideally, SONICx measures the performance based on engineering requirements and behaves as the engineering translator between systems and facility teams. Overall, Synergy supported the project from design through operations.

WEBSITE

www.synergy-engineers.com

LOCATIONS

Grand Rapids, MI
Royal Oak, MI
Tampa, FL
Charlotte, NC