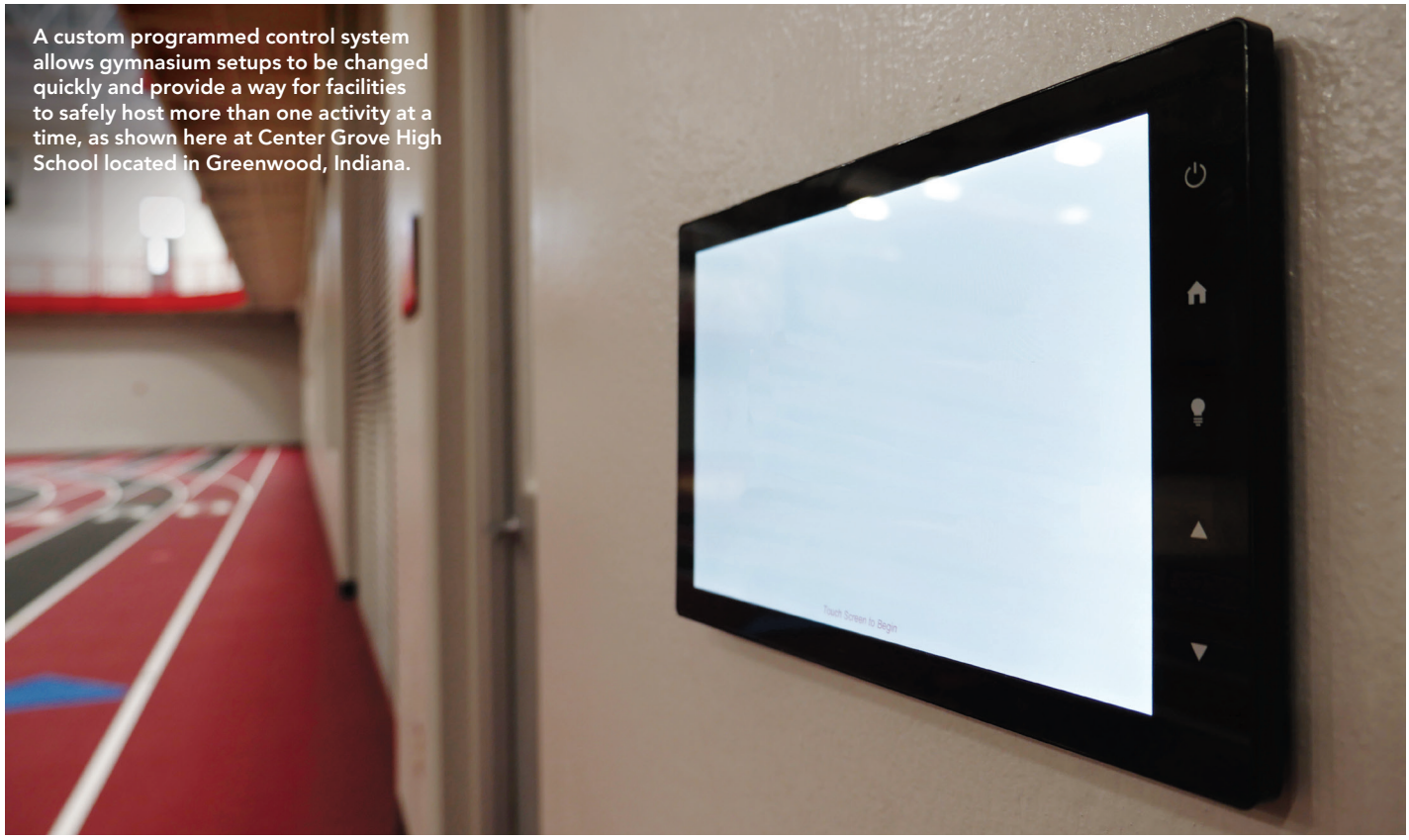

A custom programmed control system allows gymnasium setups to be changed quickly and provide a way for facilities to safely host more than one activity at a time, as shown here at Center Grove High School located in Greenwood, Indiana.

Photo courtesy of Draper Inc.

Taking Control: Planning for Optimum Gym Systems

Selecting the right gym equipment control systems for optimized operations

Sponsored by Draper Inc. | *By Barbara Horwitz-Bennett*

From high school gymnasiums to community recreational centers to collegiate athletic facilities, indoor sports are a major source of activity, physical education, exercise, and socialization within our schools and communities.

While high-quality basketball and volleyball equipment are essential for supporting safe and enjoyable classes, practices, and games, it is also important that facility managers can safely and efficiently control and reconfigure the gymnasium equipment on a regular basis.

The key to achieving the latter is through the thoughtful application of control systems. These can range from simple key switches to canned group control systems all the way up to high-end custom programmed control systems. Whatever the case may be, the most efficient, cost-effective control solutions can only be achieved with preplanning between the facility owner, architect, contractor, and controls equipment manufacturer.

While stationary backstops and/or wall-mounted backstops folded with manually operated winches are an option for gym owners, ceiling-suspended units folded with motorized winches are by far the most commonly specified for today's gymnasiums. (See the Ceiling-Suspended Systems sidebar for additional information on this topic.)

CONTINUING EDUCATION

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Learning Objectives

After reading this article, you should be able to:

1. Explain the rules for safe operation of large gymnasium equipment.
2. Analyze the advantages and applications of control systems, from simple key switches to canned group control systems to high-end custom programmed control systems.
3. Assess the advantages of preplanning by the facility owner, architect, contractor, and controls equipment manufacturer when designing a gymnasium control system.
4. Discuss gymnasium control systems case studies that demonstrate the collaborative project team process and optimized end results.

To receive AIA credit, you are required to read the entire article and pass the quiz. Visit **ce.architecturalrecord.com** for the complete text and to take the quiz for free.

AIA COURSE #K2104F

Before delving into the details of the different gymnasium equipment control systems and project planning process, architects should be aware of a few general safety principles when it comes to heavy overhead gymnasium equipment.

GYMNASIUM EQUIPMENT CONTROL SAFETY

Because gym equipment like basketball backboards suspended overhead weigh thousands of pounds, it is essential that the equipment be raised and lowered in a safe manner. Consequently, only authorized and properly trained individuals should operate the equipment. Further, the equipment should never be operated when people are underneath or in the area around it.

When controlling the equipment, the individual raising or lowering the backboard, volleyball net, or gym divider curtains, for example, must be in full view of the equipment the entire time that it is in motion. All control systems also require a key or password to prevent unauthorized users from operating the equipment.

In an *Athletic Business* article titled "Technology Makes Accommodating Gym Activities Easy," Senior Editor Paul Steinbach writes, "Most systems in place today, including those still employing individual key switches, require continuous contact with the controller while the equipment is in motion. If at any point a button or key is released, the equipment stops instantly—a handy feature when a potential obstacle has been spotted."

Photo: Jeff Bell Photography

Electric height adjusters are among the equipment that is controlled by a control system, as shown here at the ArchBold Evangelical Church in Archbold, Ohio.

KEY SWITCHES

The most basic control for gym equipment is key switches where one piece of equipment is operated from each key switch with a dedicated circuit for each device. Switches are available from one key on a single-gang plate up to seven keys on a seven-gang cover plate. The technology is very reliable and secure, assuming keys are only issued to trained and authorized individuals.

To maximize effectiveness and safety, it is important to avoid some field-observed pitfalls. These include leaving keys in switches, which effectively leaves the control open for anyone to operate. Without proper training, unauthorized users can potentially operate equipment in a dangerous manner.

Another problematic issue is simultaneously running multiple devices by holding down multiple key switches at the same time in a manner that leaves the user unable to observe equipment in operation. Users should also be cautioned against using broom handles, heavy chains of keys, or other methods to hold the switch in an on position while the operator walks away and fails to supervise the raising and lowering of very heavy equipment.

WIRELESS REMOTE CONTROLS

The first advancement beyond key switches was the introduction of wireless remote controls more than 30 years ago. Wireless controls work with a receiver at each motor and handheld transmitter, similar to a garage door opening system. The receivers are programmed, frequently with dip switches, and each device is assigned its own unique channel. Operated by radio frequency (RF), the users select the chosen channel from the transmitter, but they must be physically located no more than 100–125 feet in proximity to the receiver.

Though it is very rare, there is a small possibility that the transmitter could interfere with other RF devices or encounter interference.

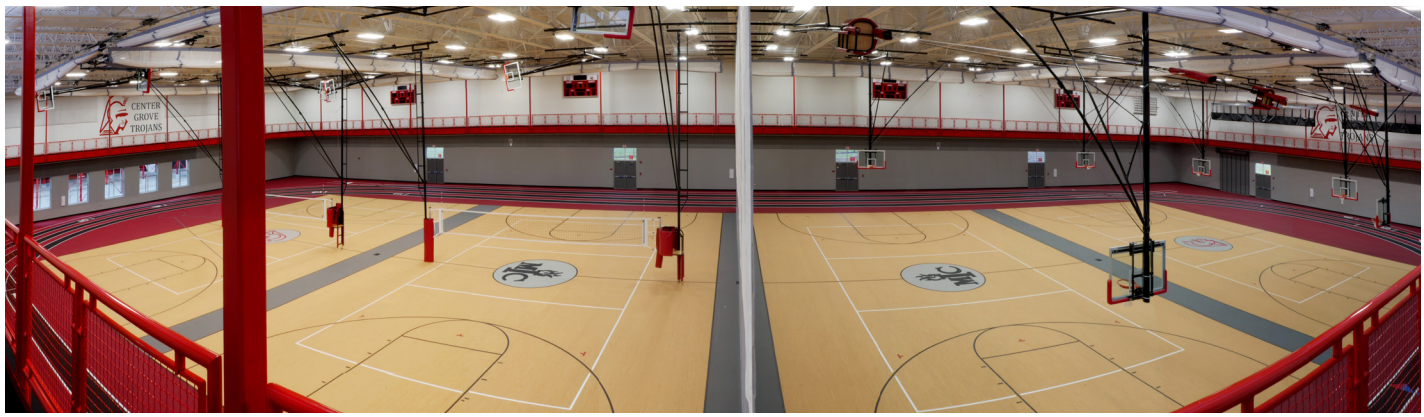
Higher-quality wireless systems will prohibit multiple transmitters from attempting to operate at the same time by locking out the other channels while one device is being operated. Consequently, a second and third transmitter, for example, will not be able to access any channel for multiple wireless operations. This means that users are typically restricted to operate one device at a time. Groups can be created by setting more than one receiver at the same frequency, but then the ability to individually operate devices at that frequency is lost.

To prevent unauthorized users from activating the controls, the handheld transmitter should be kept under lock and key

Photo courtesy of Draper Inc.

When operating heavy gymnasium equipment, the facility manager must be in full view of the equipment, and continuous contact with the controller is required while the equipment is in motion.

Photo courtesy of Draper Inc.



Group control allows multiple pieces of equipment to be moved simultaneously, as shown here at Center Grove High School.

and not mounted to the wall where anyone can access it. There is an option to add a low-voltage key switch as a backup in case the remote control is lost or dropped.

A major benefit with wireless controls is that that they eliminate the need to pull wire to key switches down on the wall, as the system only needs power at the winch in the ceiling. Consequently, wireless works well for retrofits or renovations.

GROUP CONTROL SYSTEMS

Group control systems allow for more flexibility in controlling gym equipment. Many systems can share circuits and may even require it. The password-protected system is controlled by turning the relays on and off. Because multiple devices can operate simultaneously, this significantly decreases setup time between games or events.

Group control systems typically fall into one of two categories: canned field programmed systems with limited programming options, and custom programed systems that are more flexible and can be tailored to a facility's specific requirements.

Canned systems are more economical, as the cost can be offset by savings on electrical costs if the system is large enough.

The systems are usually operated with a numerical keypad. Some have LED lights to communicate back to the user, and some incorporate LCD screens for communication. The system should include a visual guide or legend to help the user identify each component within the system.

Preconfigured relay boxes, typically with eight sets of two relays, can be networked to increase system capacity.

The system requires shared circuits because it functions as a distribution system for the electrical circuit. Multiple relays are fed with a single circuit, and the operator tells the system which devices/relays to operate by interfacing with the keypad.

Most relay boxes are connected to more than one circuit to allow the creation of groups. At the same time, the system should include a way to prevent overloaded circuits.

For most canned systems, each relay box is fed with two 30-amp circuits to enable two devices per circuit to operate simultaneously. This allows up to four devices per relay box, two on each circuit, to run together. The group sizes are typically capped at eight devices, which requires two or more relay boxes with two 30-amp circuits each. The data is conveyed via two low-voltage and communication cables from the keypad to the relay box. Keypads typically mount in commercially available recessed switch/electrical boxes.

The electrical code permits loading a circuit to a maximum of 80 percent, which means that each 30-amp circuit feeding the control system can carry up to a 24-amp load. This would be the equivalent of running two motors simultaneously (i.e., two backstops or two divider curtains). Because a typical gym is configured with six back stops, this means that operators can put the two main back courts on the same group, which subsequently cuts the setup time in half. However, the group of devices must all run up or down. It is not possible to concurrently send one up and bring another down.

Historically, a basic control system in the early 2000s would run one device at a time. Some 10 years ago, the basic system became a little more sophisticated, allowing users to create groups, so circuit sizes were changed from 20 amps to 30 amps.

Today, users can include two devices on one 30-amp circuit and an additional two on a second 30-amp circuit. If more than one relay box is utilized, another four devices (two per 30-amp circuit) can be added, and it now becomes possible to simultaneously operate eight devices at a time. However, the canned systems typically cap group sizes here.

With a typical price tag of under $5,000, for projects where budget is an issue but the owner wants the control system to have the capability of sharing circuits and operating equipment in groups, a canned system could be a good solution. However, there is limited programmability and less sophistication. For example, the user interface usually looks like a telephone touchpad with numerical controls.

CUSTOM PROGRAMMED SYSTEMS

With a larger front-end investment, custom programmed systems are a more feature-rich option. Consequently, the system can be programmed to match the facility's exact requirements.

This is particularly beneficial for pay-to-play or other large multiuse facilities that frequently change their setup for the next group coming in. The ability to operate multiple pieces of equipment at one time significantly reduces down time between facility bookings and labor costs to operate equipment for switchovers. Whereas with key switches, the switch must be held down to move one piece of equipment at a time, these advanced systems can move the equipment in a fraction of the time.

For example, a row of courts with six basketball backstops and six overhead volleyball systems can all be activated at the

push of a button. With this example, all 12 pieces of equipment running together would take about 3 minutes to fully fold, whereas with individual key switches, it could take up to 36 minutes to fold all 12.

With the ability to share circuits, building owners can often recoup their investment through electrical savings on larger jobs.

That said, there are some limitations on how many devices can be grouped together, circuit sizes, number of circuits, and what an operator can reasonably observe operating simultaneously, as he or she must still be able to watch the equipment during operation.

Custom programmed systems are typically comprised of relay boxes, an interface, and a processor assembly, similar to a small computer. Some systems use ethernet and some use low voltage for communication between components.

Many systems incorporate a touchscreen interface between 5 inches and 10 inches in size. It can be a small text screen with a visual guide or legend, or a larger screen that supports graphics to match the exact building layout, essentially presenting a map on the screen. The wall-mounted interface is advisable for protection from theft or damage.

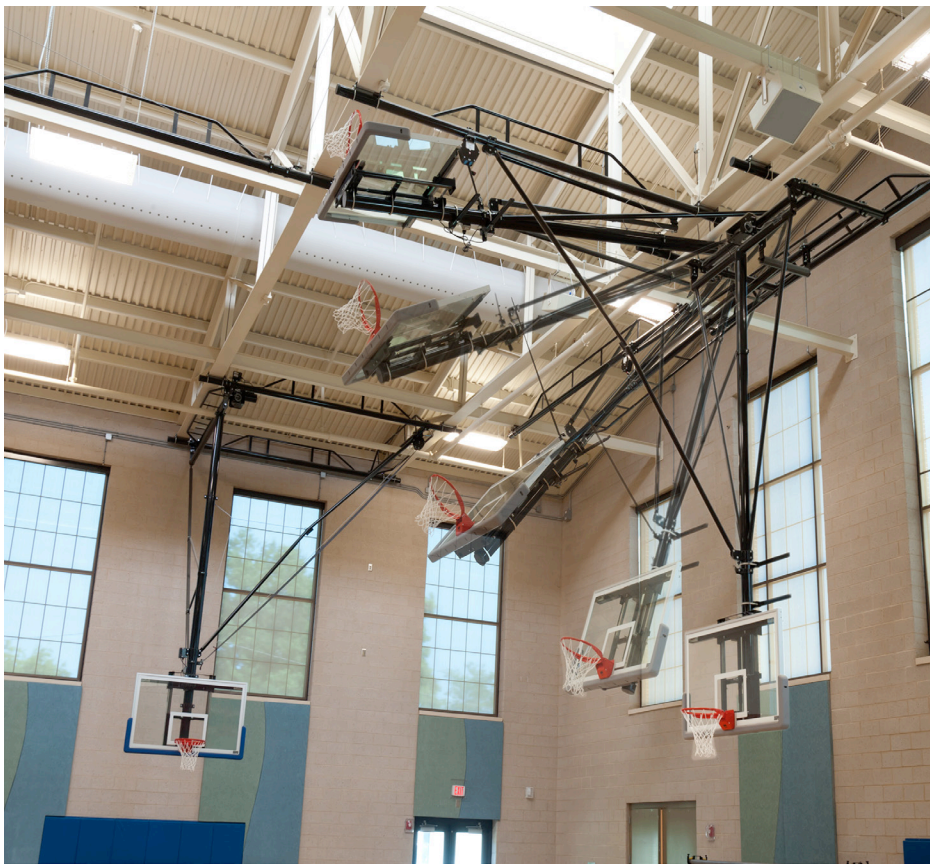
Operators can also utilize a Wi-Fi connection and run the system using a tablet, allowing them freedom of movement to better supervise the equipment in motion. With Wi-Fi, it should be a closed, secure, and password-protected system. Further, it should not be connected to the internet. This prevents users from operating the systems from home when no one is on hand to watch the equipment. In the event that the tablet is lost or dropped, it is a good idea to have a hardwired touchscreen as a backup.

CONCLUSION

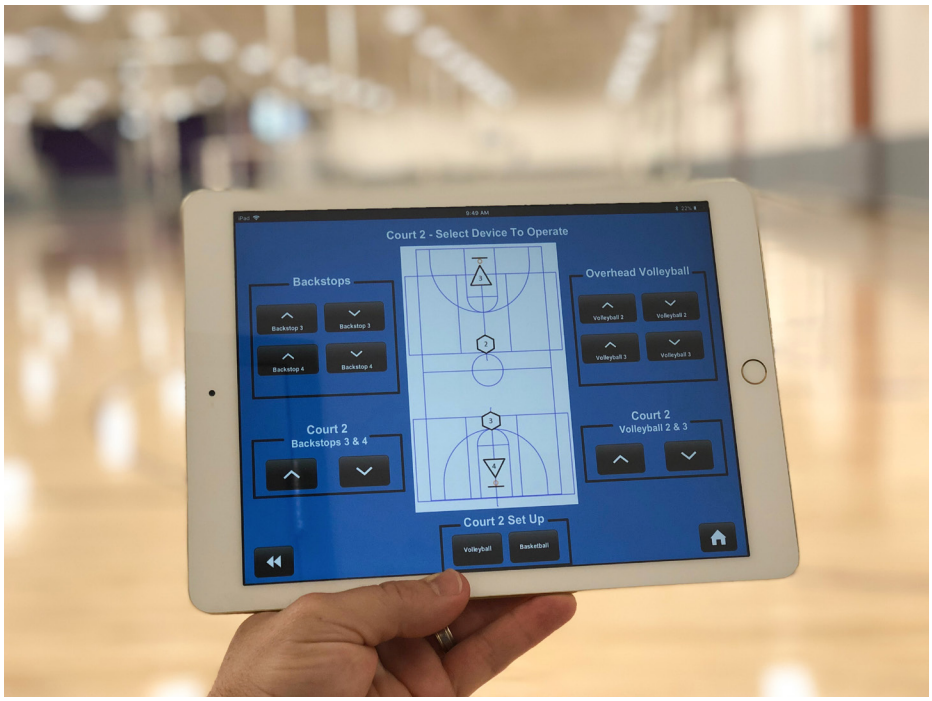
Gym owners now have access to a variety of advanced control systems. Offering considerable convenience, they can set up their equipment in a fraction of the time than it has traditionally taken. This translates to significant labor savings and, particularly with pay-to-play facilities, enhanced revenue.

At the same time, selecting the right control system is very important and best done with early input from the manufacturer. Architects will be best equipped to provide their clients with the best technological solutions by tapping into the control manufacturer's expertise and coordinating with the owner, contractor, and manufacturer early on in the design process.

Photos courtesy of Draper Inc.



The ability to fold equipment up to the ceiling is key to supporting a multipurpose facility used for assorted sports and events.



The graphic interface for custom programmed control systems allow for easy, one-tap control for different tasks.

Photo courtesy of Draper Inc.

Gym-divider curtains are raised or lowered to accommodate several and varied activities.

CEILING-SUSPENDED GYM EQUIPMENT ADVANTAGES

A mainstay of today's gymnasiums, basketball backboards and volleyball nets are in high demand. Statistica reports that wholesale sales for basketball backboards amounted to about $181.2 million in 2019, while $84 million was spent on volleyball balls and sets.

While school and community gymnasiums can opt for portable sports equipment like portable backstops, the vast majority are choosing ceiling-suspended basketball and volleyball systems for ease of equipment changeovers and enhanced safety.

"Ceiling-suspended units are by far the most widely used (one manufacturer estimates that they represent 85 percent of the market), with several operational advantages. Touchscreen or keypad control can drop ceiling-suspended goals into place in minutes, and once deployed, they are ready for action," writes Senior Editor Paul Steinbach in an *Athletic Business* article titled "Technology Makes Accommodating Gym Activities Easy."

Each basketball hoop has its own suspension system and a motor with cabling to raise and lower it. The units can be designed to fold in any direction, mounted on nearly any type of roof, and are extremely stable and rugged.

"Ceiling-suspended equipment has gained such favor in facilities designed with adequate load-bearing properties in the roof and spatial relationships in the ceiling, where stored equipment must coexist with lighting and air-handling hardware," Steinbach adds.

Similarly, ceiling-suspended volleyball net systems are preferred over stanchions manually mounted within floor sleeves. The systems are lowered to playing height by a motor on the ceiling, and they can be set in place within a couple of minutes.

One "major advantage to having drop-down volleyball nets is in the reduction [in] damage done to the gymnasium floor," explains Marian V. Liautaud, director of marketing with the Frankfort, Illinois-based Aspen Group design-build firm. "There is always potential for scratches and other damage if members of the men's/women's volleyball league, youth group, or community are constantly lugging heavy net posts around the gym between setup and teardown."

Of course, the other main benefit of electrically controlled ceiling-suspended equipment is the ease and speed with which facility managers can change over equipment. This is especially important with community facilities and privately owned sports centers where courts are rented out by the hour.

In another *Athletic Business* article, "Controlling Ceiling-Suspended Gymnasium Equipment," Sandy Harris, director of the Park District in Schaumburg, Illinois, relates that her team can make the switch from four-court Saturday morning league basketball to a six-court afternoon volleyball tournament in a matter of minutes, whereas manually installed floor-mounted nets would take at least an hour.

"It is definitely a time-saver," Harris says. "It takes about a minute to bring the volleyball nets down. Plus, you do not have to account for storing all that equipment. It is all right up in the ceiling."

Folding equipment also allows more optimized use of gymnasium space. For example, if the gym is needed for dances, cheerleading competitions, festivals, etc., folding up the backstops and volleyball nets is a quick job. Additionally, ceiling-mounted divider curtains can be easily brought down to divide up the space for multiple, simultaneous events and provide an extra measure of safety for users, as they prevent balls from flying or rolling into adjacent activities.

Photos courtesy of Draper Inc.

PREPLANNING PAYS OFF

Thanks to involvement early in the planning stages, experts were able to offer options and solutions to provide the facility owners—Placer County Fairgrounds of Roseville, California, in collaboration with Placer Valley Tourism—as they planned a state-of the art gymnasium facility while staying within budget. Further, because the manufacturer was able to work with the owner, architect, developer, general contractor, and project electrician, the specified gymnasium equipment and control systems met the desired performance criteria.

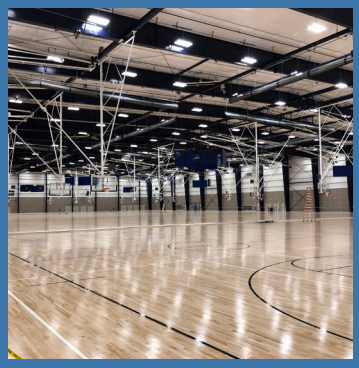
This facility is a large venue with a layout of four bays. Each bay has three side-by-side-by-side, 84-foot, high-school-sized basketball courts with two volleyball systems running across each basketball court. In addition to hosting basketball and volleyball competitions, the facility hosts cheerleading competitions as well as exhibits and other events, so all equipment must fold up to the ceiling to allow for 35 feet of clear space over the floor area.

Each backstop on each court is electrically operated and includes electric 8-foot to 10-foot height adjusters. Each volleyball court has an electrically operated overhead volleyball system with divider curtains in between and at the ends of each basketball court to prevent balls from rolling into adjacent activities. Additionally, each basketball court has two scoreboards suspended from electric lifters. In all, the facility has 24 basketball backstops, 24 electric height adjusters, 24 overhead volleyball systems, 24 scoreboard lifters, and 17 gymnasium divider curtains.

Capitalizing on Controls

A significant challenge was to provide control-system options that supported the owner's ability to perform rapid change setups for a variety of activities, with an eye toward budget and sharing as many electrical circuits as possible. Most gymnasium equipment products—including basketball backstops, divider curtains, overhead volleyball systems, and scoreboard lifts—operate with ¾ HP motors that require a dedicated 20-amp circuit. Traditionally, these types of systems have been operated with individual key switches. Using traditional controls, the gym equipment would have required 113 circuits with 113 wall-mounted key switches and many people and/or a lot of time to change court setups for different activities.

A custom programmed control system that utilizes a central processor, one or more relay boxes, and one or more user interfaces, available in various sizes, was provided instead. For this specific project, the designed system utilizes five relay panels: four panels capable of operating 32 motors and another capable of operating four motors. Also provided was a 10.1-inch graphic wall-mounted ethernet touchscreen with a project-specific control interface program, a tablet with the same interface program, and a Wi-Fi kit with three access points to allow the tablet to talk with the processor. The Wi-Fi is a closed network utilized only by this system, so the tablet users must remain in the gym so that they can watch equipment operating and no one outside of the area has access.



Placer County Fairgrounds in Roseville, California, is a large venue with four bays of three side-by-side-by-side, 84-foot, high-school-sized basketball courts and two volleyball systems running across each court. For hosting other sporting events, all equipment had to fold to allow 35 feet of clear space over the floor area.

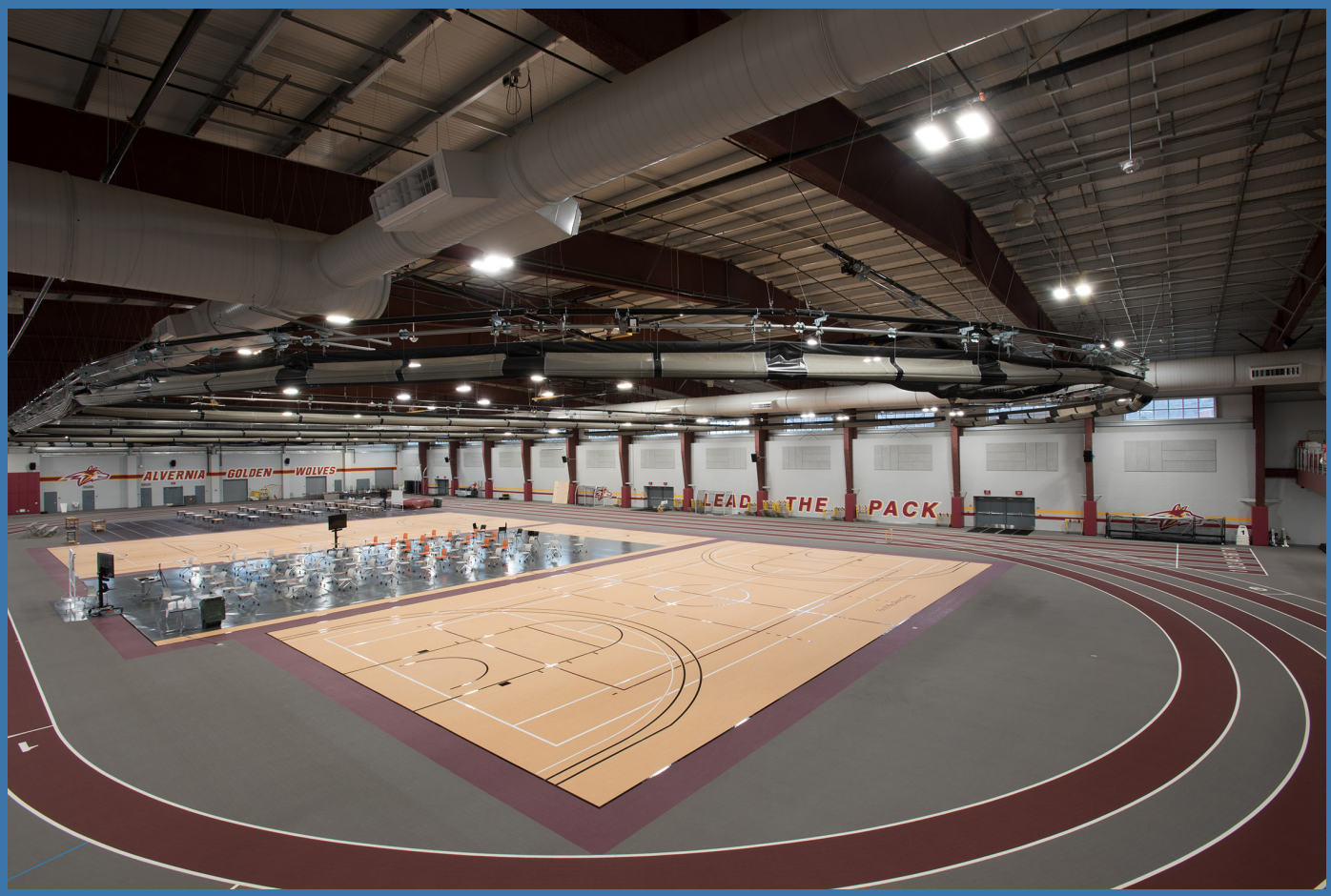
With careful planning, a schematic that utilized only 36 circuits was devised, enabling a reduction of close to 70 percent in the 20-amp circuits required.

The manufacturer analyzed the floor plan and made several suggestions, such as allowing the facility to rapidly change setups and allowing for devices, which will never run together, to share circuits in a manner to prevent any chance of overload. With careful planning, a schematic that utilized only 36 circuits—an almost 70 percent reduction in 20-amp circuits required—was the outcome. This level of reduction resulted in fewer electrical panels and circuit breakers, achieving lower electrical equipment costs.

Based on planning for shared circuits, user interfaces for the wall-mounted touchscreen and tablet were created that included building layouts for easy navigation. The initial screen has the overall layout and the option to select any one of the four bays. From there, the user is sent to the screen for the chosen bay that shows the specific bay layout and has options to drill further down to individual courts. It is always possible to operate devices individually or at the court level, but on each bay screen, there are single-court setup buttons to allow a user to change all three courts in the bay from volleyball to basketball or vice versa. The volleyball setup button simultaneously raises all six height adjusters, moves all six backstops to the stored position, and lowers all six overhead volleyball systems to the playing position. There is also a single button to raise or lower every divider in each bay—as many as eight curtains in some bays. Similar setup buttons are available at the court level as well. These large functions—as many as 18 devices running simultaneously—are accomplished without ever causing an overloaded circuit.

Time savings in changing bay layouts is huge compared to having one or two devices running at the same time from key switches. One person can set up the entire facility in a matter of minutes instead of hours. This allows the facility to require less time between events and in many cases, host more events that can lead to greater revenues. The larger the facility, the greater the time savings.

Photos courtesy of Draper Inc.

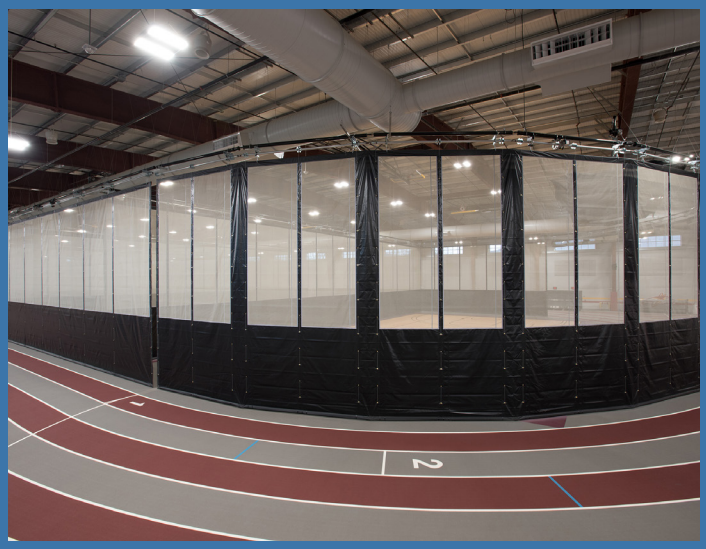


MEETING UNIQUE REQUIREMENTS

Alvernia University is a private Franciscan university located in Reading, Pennsylvania. The university hosts approximately 3,000 students and participates in NCAA Division III athletics.

The Tom and Helen Flynn PLEX at Alvernia University is a nearly 100,000-square-foot athletics, recreation, wellness, and health science complex that opened in September 2019 and features four basketball courts circled by an 8-lane track. The facility also features fold-up and radius-fold divider curtains to separate the basketball courts from each other and from the running track so simultaneous activities can take place without worrying about balls going into adjacent areas. The facility also features multi-sport practice cages, volleyball courts, and tennis courts.

"The PLEX facility was designed with maximum flexibility for multipurpose usage by students, faculty, and the community in mind," says Franklin D. Watts, vice president of Reading, Pennsylvania-based Burkey Corporation, the contractor on the project. "We needed to have a system that could interact with all of the sports equipment as well as the divider wall system to properly handle quick turnover for the various sports teams and events, the physical therapy department and their patients, campus-wide events, etc."



The local fire marshal was concerned about safe evacuations from the gymnasium during a fire alarm. The fire-protection solution was enabling an electronic pulse from the first alarm to communicate with the gymnasium equipment control system, causing all curtains to raise when the alarm is activated.

Further, the controls system had to handle all of the moving parts in various capacities but be simple enough to be operated via touchpad or remote tablet by multiple individuals.

The solution was a custom programmed control system that included a 48 relay box capable of operating 24 directional devices, a 7-inch wall-mounted ethernet graphic touchscreen with graphical interface program, a tablet with the same interface program, and a Wi-Fi kit to allow the tablet to talk with the processor. The Wi-Fi network is a closed system utilized only by the control system, so the tablet user must stay in the gym so that individual can watch equipment under operation. No one outside of the area has access. Because the electrical engineer elected to use a dedicated circuit for each device, the control system included group buttons to simultaneously operate up to eight devices for easy and rapid setup changes.

"The University wanted a universal system that was easy to operate. The system [we specified] does not require individual, manual, or wall-mounted controls—just a wall-mounted central computer and an iPad, which saves time in setup. Likewise, there is no need to keep different manual keys or controls for each piece of equipment," relates Joseph G. Kane III, construction administrator with Lititz, Pennsylvania-based Derck & Edson Associates, the firm that designed the PLEX facility.

As the only school in its conference with a fully NCAA-compliant indoor track and field, Alvernia hosts conference championships and the PLEX Shootout Invitational meet. The facility is also used for club sports, classes, convocations, and many other campus events. Large and varied events mean big numbers of students, athletes, and/or spectators, and the need to protect those people.

"In early discussions with the university, architectural and engineering team, and manufacturer, it became obvious that we would need a system that could handle the complexities that come with a multipurpose facility," Watts relates. "There were also some code-driven requirements that could not have been satisfied with some of the other control systems on the market or by way of key switches."

Meeting Fire Code

With large events and multiple activities happening simultaneously, the way equipment could be deployed, especially divider curtains and practice cages, could have created safety concerns should the need ever arise to evacuate the facility. With curtains as long as 100 feet wide, the only option for egress is typically to run to one end of the curtain to exit. But with multiple curtains running different directions or even wrapping around the inside of the track, in an emergency, the building may seem more like a labyrinth than an athletic facility. Based on these concerns, the local fire marshal required that the divider curtains be interconnected with the building fire alarm so that when the alarm is activated, the curtains start to raise.

When first approached, the manufacturer's initial reaction was to suggest that the project electrician and electrical engineer create an interface to meet this requirement, as it did not see a way to make the control system communicate with another party's fire alarm system. However, after a little research and trial-and-error experimentation, a solution was developed that made it very easy to meet this unusual requirement and provide the level of safety required.

Ultimately, the law required that the divider wall system and batting cages be designed in such a way that they would be raised immediately should the fire alarm system be activated. "By working closely with the engineers, the manufacturer's IT folks, our installer, the electricians, and the fire alarm vendor, we were able to modify the various system components that were required to communicate with each other regardless of the scene or program setting in place at the time of activation," explains Watts.

Utilizing one of four optional digital inputs available on the programmable controller, the manufacturer was able to assign a "fire alarm" command that is actuated by a dry contact pulse emitted by the alarm system when the fire alarm is activated. The signal had to be a pulse because at the falling end of the pulse, when signal is removed, the fire alarm command is sent out across the entire network and continues to be sent for 5 minutes. Since each divider and practice cage is on a dedicated circuit, the fire alarm signal was placed into commands that control each individual curtain and practice cage, so those items are turned on in the up direction for a period of 5 minutes. Raising curtains and practice cages if the fire alarm is activated allows for everyone inside the facility to rapidly exit in the event of an emergency.

"Along the way, we were sure to keep the fire marshal and code officials in the conversation updated on progress to assure their comfort level with the design. They were very pleased with the end result and satisfied with the response time of the wall system, allowing for a safe and unhindered mass exit from the building during an emergency," Watts states.

Programmable control systems allow huge amounts of flexibility to control all kinds of operable gym equipment, lighting, scoreboard, window shades, and bleachers.

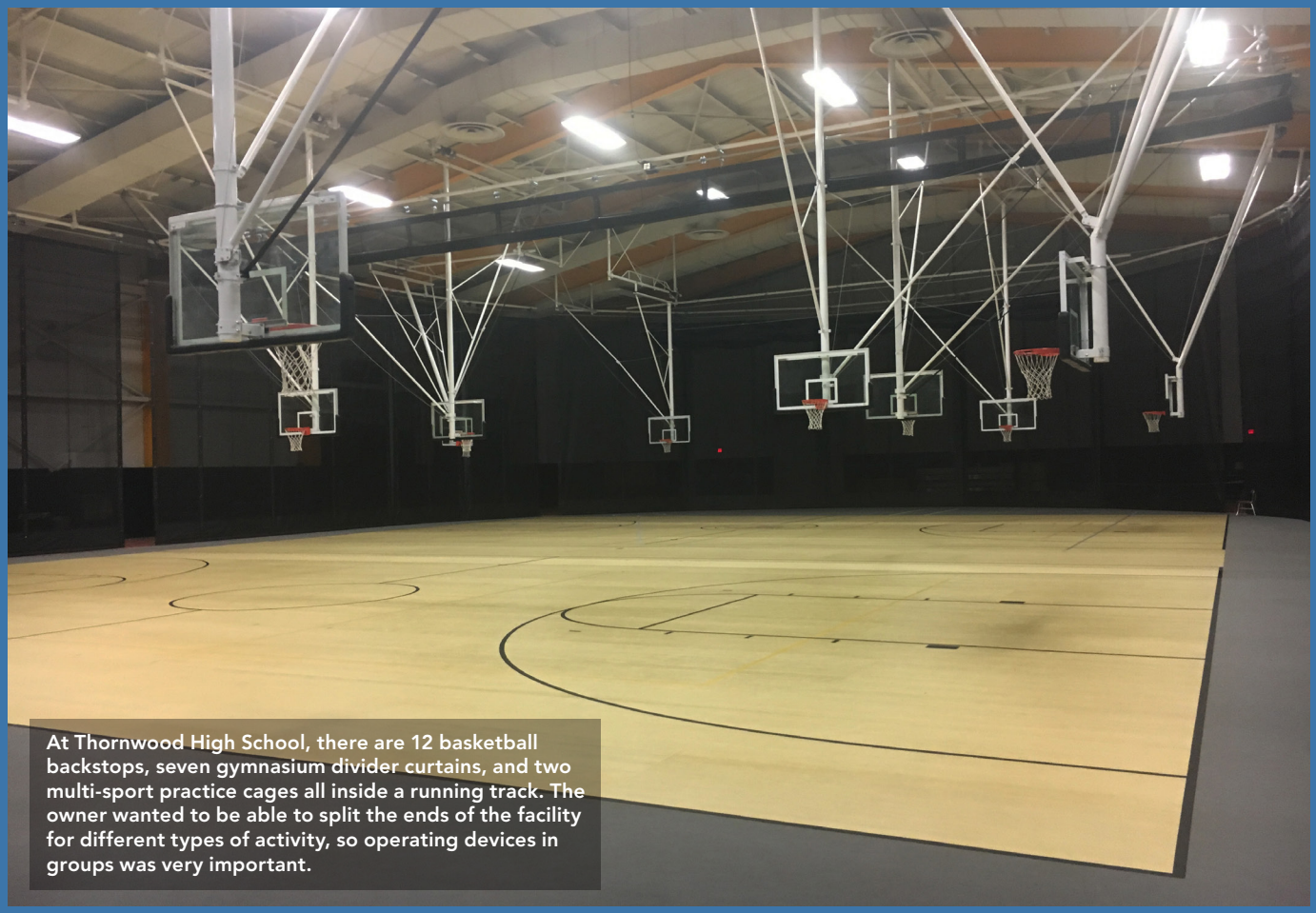
Integrated Effort

As this was a unique project with unique requirements, early collaboration between multiple parties was essential.

"The manufacturer assisted in the contractor's and the electrical engineer's request for information on netting and equipment contacts, power requirements for motors, wire sizes, and voltage requirements for coordinating with the fire safety system computer," Kane relates. "They also assisted in expediting information before the equipment order was placed to assure that it met the university's request and proper installation could be done by the contractor before it arrived on-site."

Watts points out a few other benefits that materialized from early collaboration: "The collaborative effort between all parties, including early input from the controls manufacturer, helped to not only deliver a system that could handle the needs of the university but also avoid potentially significant costs and delays that could have materialized otherwise," he states. "Without the ability to meet the local code requirements regarding emergency egress, the completion date of the project could have been greatly impacted, and there is a very good chance that certain elements of the design, including the divider wall system, may have been eliminated from the project altogether."

Photo courtesy of Draper Inc.



At Thornwood High School, there are 12 basketball backstops, seven gymnasium divider curtains, and two multi-sport practice cages all inside a running track. The owner wanted to be able to split the ends of the facility for different types of activity, so operating devices in groups was very important.

PREPLANNING KEY TO HIGH CONTROL FUNCTIONALITY WITH BUDGET-FRIENDLY CONTROL SYSTEM

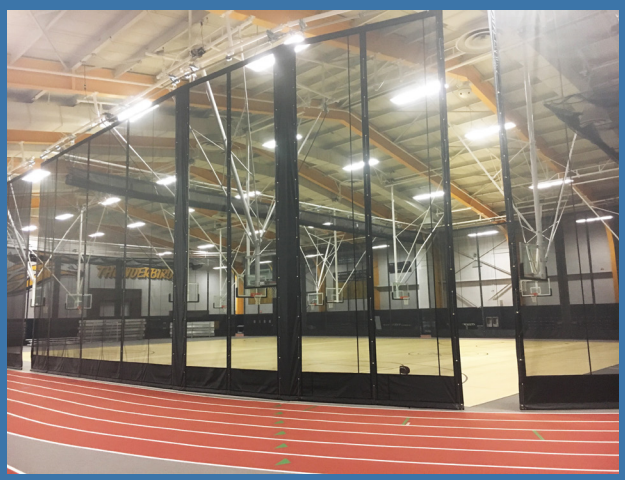
When Thornton Township High School District 205 on the south end of Cook County, Illinois, decided to renovate athletic field houses at two of its high schools, Thornton Township High School and Thornwood High School, budget was a concern, as is the case with many school construction/renovation projects. Both schools had large fieldhouses that were constructed in the early 1970s and in need of updates and new equipment to better match current needs.

For both schools, there were several backstops, indoor multi-sport practice cages, and divider curtains, including perimeter curtains running on the inside of a running track. Because the space was used for physical education classes covering different activities all day long and also by many teams for practice after school hours, it was necessary to have an efficient way to control equipment while staying in budget. A canned, field-programmable control system was chosen as the right solution.

The system serves as a power-distribution system that shares one circuit among a maximum of four devices, while still allowing group operation. To accomplish this feat, the system has relay boxes that are connected to dedicated 30-amp circuits. Typical motors for operating basketball backstops, divider curtains, and practice cages are either ¾ HP rated at 9.8 full load amps (FLA) or 1 HP rated 11.2 FLA. According to the National Electrical Code, any circuit can only be loaded to a maximum of 80 percent of the overload protective device (circuit breaker or fuse) so that the initial inrush current does not exceed the overload protection rating. Inrush current is the maximum instantaneous draw that occurs when starting a motor, especially if there is a load or weight on the motor at start up. A single 30-amp circuit can accept two 1 HP 11.2 FLA motors and still be under the maximum circuit load of 24 amps (30 amps x 0.80), so it is possible to simultaneously operate up to two motors per circuit. Groups are typically capped at eight devices to make sure that no group is too large to be carefully viewed during operation.

Using Thornwood High School as the example on this project, there were 12 basketball backstops, seven gymnasium divider curtains, and two multi-sport practice cages all inside the running track. The owner wanted to be able to split the ends of the facility for different types of activity, so operating devices

Photo courtesy of Draper Inc.



Combining the right number of relay boxes and multiple keypads in a canned system allowed for numerous and large groups with high functionality at Thornwood High School at an affordable price.

in groups was very important. Due to the number of equipment pieces being operated, three relay boxes, each capable of operating eight devices, were required. Each relay box was connected to two 30-amp circuits. Since the number of groups needed was more than the 10 that can be stored in each keypad, two keypads were utilized.

The dealer, installer, architect, and electrician worked together to strategically plan where each device should be attached and in which relay boxes. For example, with 12 backstops, they carefully planned that only two backstops were attached to each circuit, allowing them to combine almost any combination of eight backstops to run simultaneously. Groups were created to simultaneously run all four main court backstops, all six backstops on the north court, all six backstops on the south court, and all eight of the crosscourt backstops. Groups were also created to simultaneously operate all the divider curtains, just the north curtains, and just the south curtains. In addition, the control system always allows for any single device to be operated individually.

The same type of careful planning was used at Thornton Township High School to allow its field house—with 18 backstops, 10 gym divider curtains, and two multi-sport practice cages—to operate as desired and allow rapid changes for different classes and activities.

By carefully plotting where devices are connected and preplanning how groups were to be constructed, Thornton High School District 205 was able to complete its projects with control systems capable of operating its fieldhouses in the manner desired. It did this using canned control systems that are field programmed and friendlier to project budgets than more feature-rich factory-programmed systems. Combining the right number of relay boxes and multiple keypads allowed numerous and large groups to be set up, providing high functionality without a higher price tag.

WHY CONTROLS HAVE BECOME MORE IMPORTANT

As reflected in every facet of society benefitting from the plethora of technological innovations constantly coming out, changes in lifestyles and advances in technology are impacting gymnasiums as well. For gymnasiums, the impact comes in the demand for floor space and the need to fold gymnasium equipment more often and more quickly. Gymnasium equipment manufacturers are addressing these needs with new ways to control their equipment.

Years ago, gymnasiums were typically found only in local schools. Most schools had just one gym, and that gym had at the most six basketball backstops: two on the main court and four cross courts. The gym was used for home basketball games, occasional convocations, or maybe school pep sessions, but was normally set up for PE class and basketball practice with all six backstops in the down position. During basketball season, once a week or so before the home game, the school janitor would go to the gym, fold the crosscourt backstops, and pull out the bleachers. After the game, the process was reversed. If the school was a little older, the backstops were folded with a manual winch and maybe a drill adaptor to make the process a little easier. New schools might have had electric winches that were operated using key switches. Since backstops were folded very rarely, changing gym configurations in this manner was acceptable.

Flash forward to today. Gymnasiums in schools are used for a wider variety of activities and a large array of different competitive teams. There are also commercial or pay-to-play facilities popping up in almost every community to host AAU, club, and travel team competitions. Gyms at schools and private facilities are used for basketball, volleyball, dance teams, cheerleading, and social events like craft fairs, trade shows, and school dances. To accommodate all of these different types of events, gymnasiums now include many more basketball backstops, divider curtains, overhead volleyball systems, wrestling mat lifters, scoreboard lifts, and other types of ceiling suspended electrically operated devices.

Every gym has a huge number of teams and organizations that are vying for time on gymnasium floors and always need the space set up for their specific needs at the time they arrive. It has become increasingly more important to be able to change gymnasium setups often and with more speed. Schools need to keep students and athletes active and avoid downtime in class or practice to get equipment set. And at commercial pay-to-play facilities that rent space, time required to change setups equates to less opportunity to earn revenue. Therefore, gymnasium controls have become more important, more flexible, and more sophisticated. As indicted in this article, control systems have moved past individual key switches to keypads and touchscreens that, while maintaining safety requirements, allow faster and more efficient setup changes as well as group operation that meets facility needs.

Take the quiz at ce.architecturalrecord.com

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