

LiftMaster

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PREMIER PARTNER

SmartMarket Brief

D•N Dodge
Construction
Network

The Connected Warehouse

How Facilities Are Evolving
To Support Rapid Growth

Introduction

ABOUT THIS SMARTMARKET BRIEF

Research by Dodge Data & Analytics (Dodge) shows that the warehouse/distribution center market is among the fastest growing building types in the USA. In 2010, it generated just \$3.8 billion in construction starts, accounting for only 9% of the overall commercial buildings sector. But driven by the rapid growth of e-commerce, it is now projected for almost \$53 billion of starts in 2022, an astounding 36% share of the commercial construction sector.

THE CONNECTED WAREHOUSE REPORT

As with many intensely-used building types, these facilities are increasingly sophisticated and technologically connected. This report explores the complexity of these projects, the systems that are being installed and the evolving nature of them as vibrant 24-hour workplaces, employing thousands and playing a vital role in the nation's economy. It is based on a survey by Dodge of over 300 design and construction professionals, who create these buildings and understand the dynamics required to keep pace in a fast-changing environment. (See the Methodology on page 33 for more detail.)

Dodge wishes to thank Chamberlain Group for sponsoring this research.

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MESSAGE FROM PREMIER PARTNER

Over the past two years, the impact of the COVID-19 pandemic on the supply chain industry has exposed a range of challenges facing warehouses and distribution centers. Demand uncertainty, supply chain disruptions, labor uncertainty, omnichannel fulfillment driven by e-commerce growth will continue to further compress margins and wreak havoc on the supply chain making it a matter of not if, but when to make facility upgrades. LiftMaster is interested in supporting the growth in investment in the connected warehouse to solve both access and visibility pain points moving into the future.

LiftMaster takes access control within the facility to new levels by integrating powerful myQ technology within its reliable door operators, gate operators and loading dock equipment. With the power of myQ, LiftMaster can deliver real-time visibility utilizing automation as a replacement of manual process automation all while maintaining the highest product quality and safety standards in the dock space, helping to fill visibility gaps and providing an upgrade that lets facilities ensure a successful transition to driving digital supply chain demands.

Luke Krombach

Head of Commercial Software Product
Chamberlain Group

Macro Project Trends

INTRODUCTION

This section of the report focuses on three major trends impacting the design and construction of warehouse/distribution facilities in the US.

PROJECT INVESTMENT DRIVERS

This part of the study explores the factors that respondents report are the most compelling drivers behind their clients' capital investments in new or renovated/upgraded facilities.

URBAN LOCATIONS

As ecommerce drives increasing demand for faster order-to-delivery times, facilities need to be closer to end customers. As a result, more are being created, expanded or upgraded either in or near urban areas. This part of the study establishes the current status of this locational trend and how it has changed over the last five years.

SUSTAINABILITY TRENDS

Design and construction is becoming increasingly green across the globe, and warehouse/distribution facilities are no exception. This part of the study looks into several aspects of sustainability:

- Minimizing energy use
- Minimizing waste from operations
- LEED certification
- Zero-carbon facilities
- Green products and materials



Project Investment Drivers

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INVESTMENT DRIVERS

From the list of eight options shown in the chart at right, respondents were asked to select the three that they are seeing as the most important drivers for their clients to invest in new warehouse construction and/or renovation/upgrade projects.

The top three factors in the chart reflect facility owners' needs to respond to the dynamics of demand from their customers and increase their throughput capacity, as well as accommodating emerging business models such as on-demand warehousing.

Also ranking strongly is the need to provide a higher-quality workplace so that they can compete effectively for labor in a tight employment market. The section of this report entitled "The Warehouse as a Workplace" delves more deeply into how owners are directing facility-related investments toward that goal.

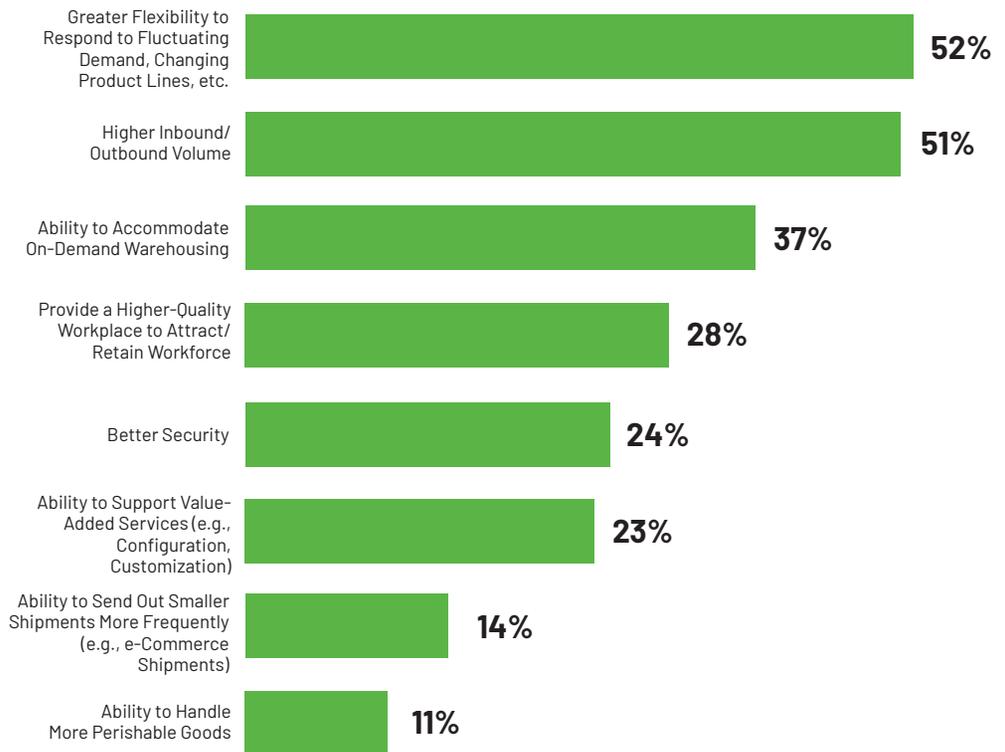
REGIONAL VARIANCE

The rankings are relatively consistent across the six regions studied. Exceptions include:

- Far more respondents from the Northeast (64%) cite the need to increase inbound/outbound volume than those in the Mountain (40%) or Southeast (44%) regions.
- The Mountain (30%) and Northeast (28%) regions cite a notably higher need for better security than either the Southeast (15%) or South (17%).

Top Business Needs Driving New and/or Upgrade Investments

Percentage of Respondents Citing Each as a Top Driver for Owners to Initiate Projects



Urban Locations

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INCREASING URBANIZATION

This section of the study asked respondents to identify two important aspects of this trend:

- The portion of their recent warehouse/distribution projects that are very close to or within urban areas.
- How the portion of their warehouse/distribution projects in these urban locations has changed over the last five years.

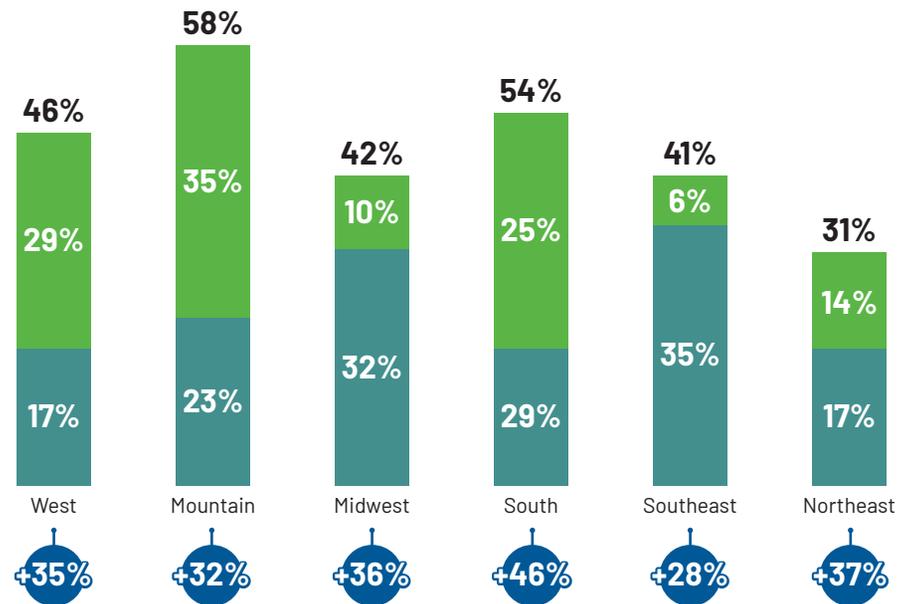
The chart at right shows the findings divided by the six regions studied.

- Every region is showing significant urban activity, especially the Mountain (58%) and South (54%), where the majority of recent projects are urban.
- All regions also report strong growth in urban locations over the last five years.

This trend is likely to accelerate as facility owners respond to end-customers' demand for ever-faster order-to-delivery cycles.

High/Very High Frequency of Projects in or Near Urban Centers

Percentage of Respondents Reporting at Least 50% Urban Projects, and Change Over Last Five Years



Percentage Reporting High or Very High Increase Over Last Five Years, by Region

■ High (50%-74% or More of Projects) ■ Very High (75% or More of Projects)

Sustainability Trends

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MINIMIZING ENERGY USE

The chart at upper right shows the responses, divided by region, to two questions:

- How important is minimizing energy use to your clients (warehouse/distribution facility owners)?
- How frequently are states/municipalities requiring increased energy efficiency in warehouse/distribution facilities?

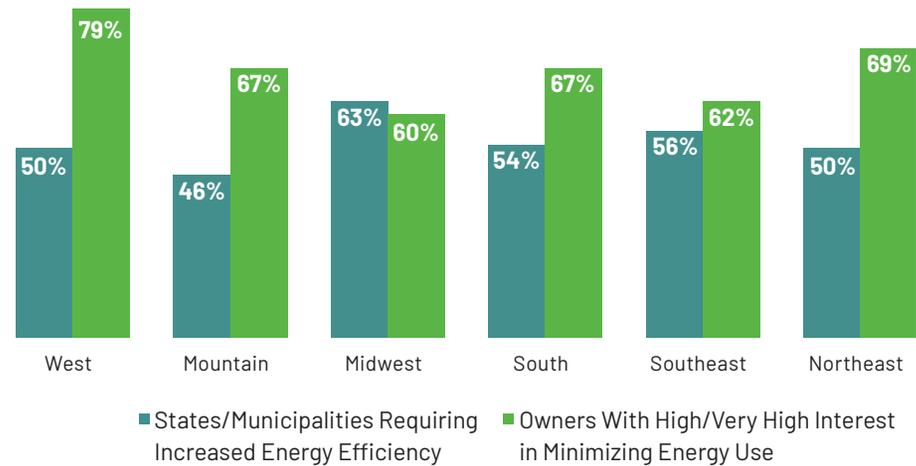
All regions report that about half (46%–63%) of the local governments are requiring energy efficiency. While this may be a partial driver for owners to prioritize it, the chart shows that the percentages assigning high or very high importance to it exceed those thresholds, suggesting they are driven by more than just regulations.

MINIMIZING OPERATIONAL WASTE

Respondents were also asked about the importance of minimizing operational waste to their clients. As the chart at right shows, there is a significant variation across the six regions among the percentages citing high or very high importance, led strongly by the West (55%) and also by the Northeast (48%).

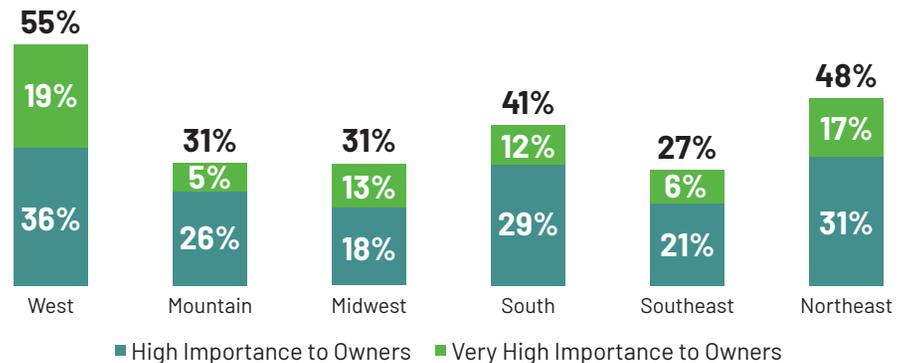
Energy Use: Government Requirements and Importance to Owners

Percentage of Respondents Reporting High or Very High Levels of Importance to Owners



Minimizing Waste From Operations: Importance to Owners

Percentage of Respondents Reporting High or Very High Levels of Importance to Owners



Sustainability Trends (CONTINUED)

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LEED CERTIFICATION

Respondents were asked to identify what percentage of their owners are seeking LEED certification for their warehouse/distribution projects.

The chart at right shows that while half to three quarters are involved to some degree, the West (33%) and Northeast (31%) cite the most significant proportions of owners engaging in this pursuit on more than 25% of their projects.

This trend may increase as customers apply more scrutiny to the nature of the facilities they are contracting with, more environmental regulations apply to these facilities and workers become more aware of the importance of green buildings to their health and safety as employees.

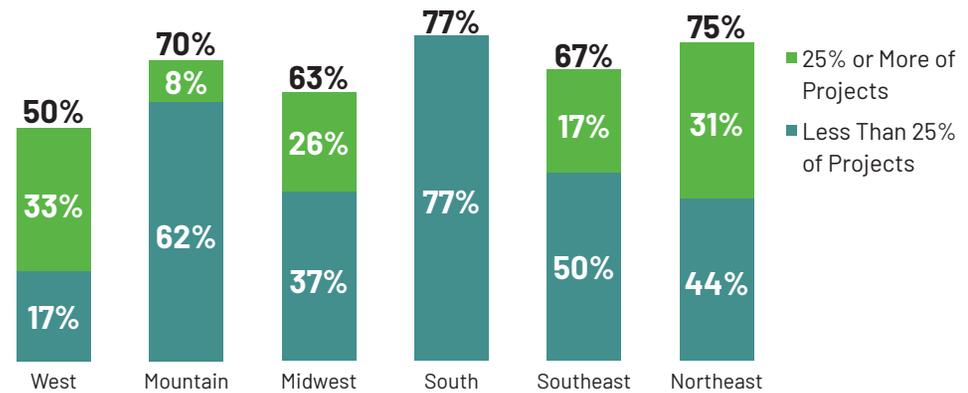
ZERO-CARBON FACILITIES

Respondents were also asked to what degree their clients are interested in creating zero-carbon facilities.

The findings show significant levels of overall interest (58%-75%), but very few that are considering it for more than 25% of their facilities. The Northeast, which leads in high level LEED certification, also leads in this sustainability category (19%).

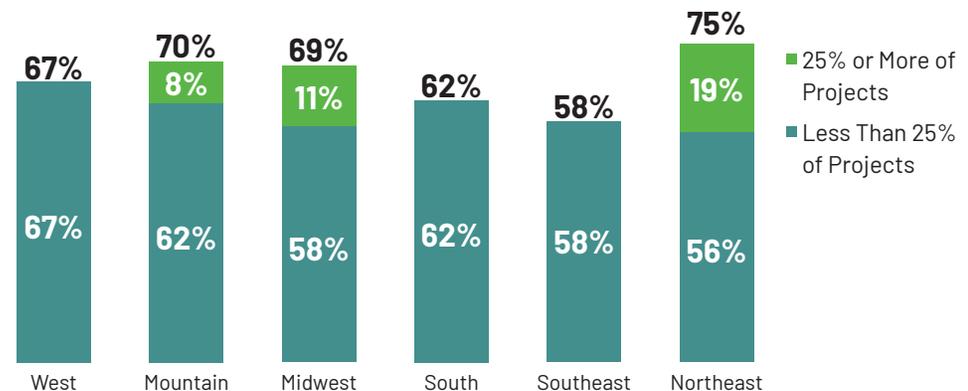
Frequency of Owners' Seeking LEED Certification

Percentage of Respondents Reporting Owners Seeking LEED Certification on Their Projects



Frequency of Owners Interested in Creating a Zero-Carbon Facility

Percentage of Respondents Reporting Owners Interest in Creating a Zero-Carbon Facility



Sustainability Trends (CONTINUED)

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GREEN PRODUCTS AND MATERIALS

From a list of nine green building elements (shown in the chart at right), respondents were asked to identify which they are using more of now in their warehouse/distribution projects than they did five years ago.

REGIONAL VARIATIONS

While the findings are fairly consistent across all six regions, some variations do occur, including:

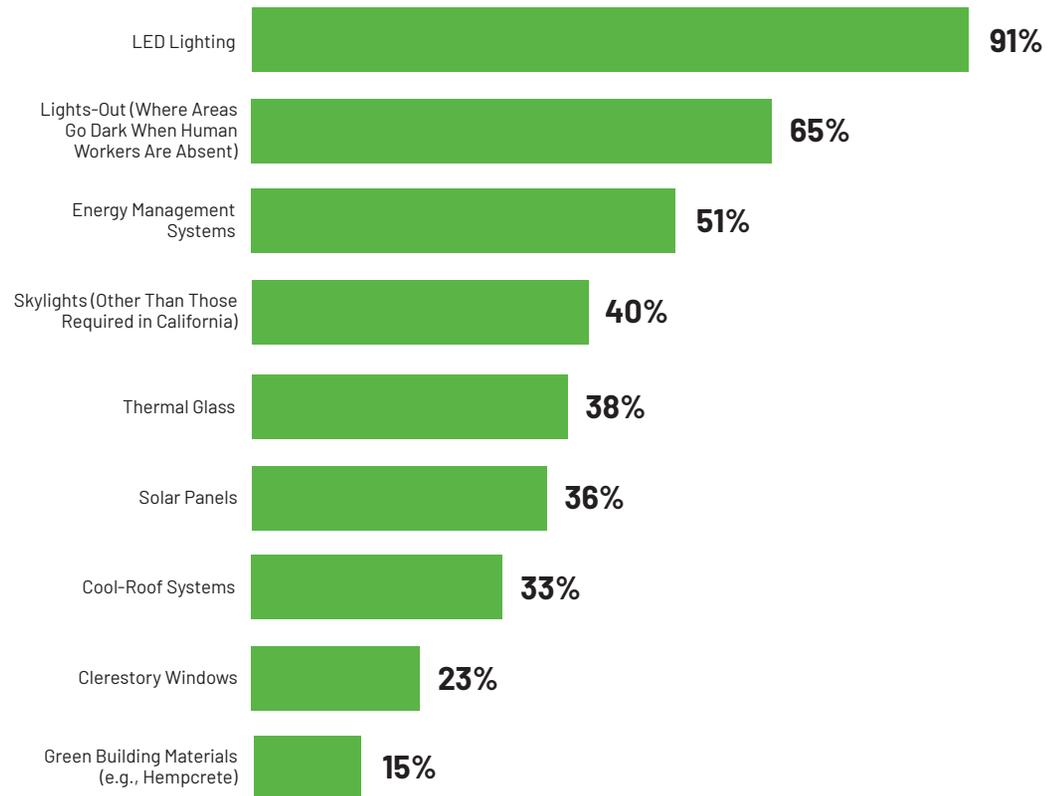
The average percentage for all nine green products and materials is 43%, but both the West and Mountain regions average higher (52%).

- The greatest regional variance is found with solar panels, where 67% report usage growth in the West, compared with just 8% in the South.
- Another variance occurs with clerestory windows, selected by 50% in the West but just 15% in the South.

The use of green products, material and systems may also increase for many of the same reasons that an increase in LEED certification might be expected.

Increased Frequency of Green Products/Materials/Systems

Percentage Reporting Increased Use of Each Over the Last Five Years



Automation and Connectivity

INTRODUCTION

This section of the report focuses on two key aspects of the increasing amount of automation and connectivity that is being designed and built into warehouse/distribution facilities.

LOADING DOCKS

Arguably the most intensive part of a warehouse/distribution facility, these areas are receiving an especially high level of attention for increased automation and connectivity between devices, building elements and digital systems. This part of the study focuses on:

- The overall level of automation of operational and handling processes at loading docks.
- The frequency of use of four specific types of automated equipment at loading docks.
- The frequency of 480-Volt power and four specific types of IT and communications systems at loading docks.

FACILITY-WIDE (OTHER THAN AT LOADING DOCKS)

The study also examines automation and connectivity throughout the rest of warehouse/distribution facilities, including:

- Frequency of facility-wide automation of operational and handling processes.
- Frequency of use of four specific types of facility-wide IT and communications systems for enhanced connectivity.



Automation of Processes at Loading Docks

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AUTOMATION OF PROCESSES AT LOADING DOCKS

Respondents were asked to identify the percentage of their projects where the facilities include automation for operational and handling processes at the loading docks.

The chart at right shows the findings divided by the six regions studied.

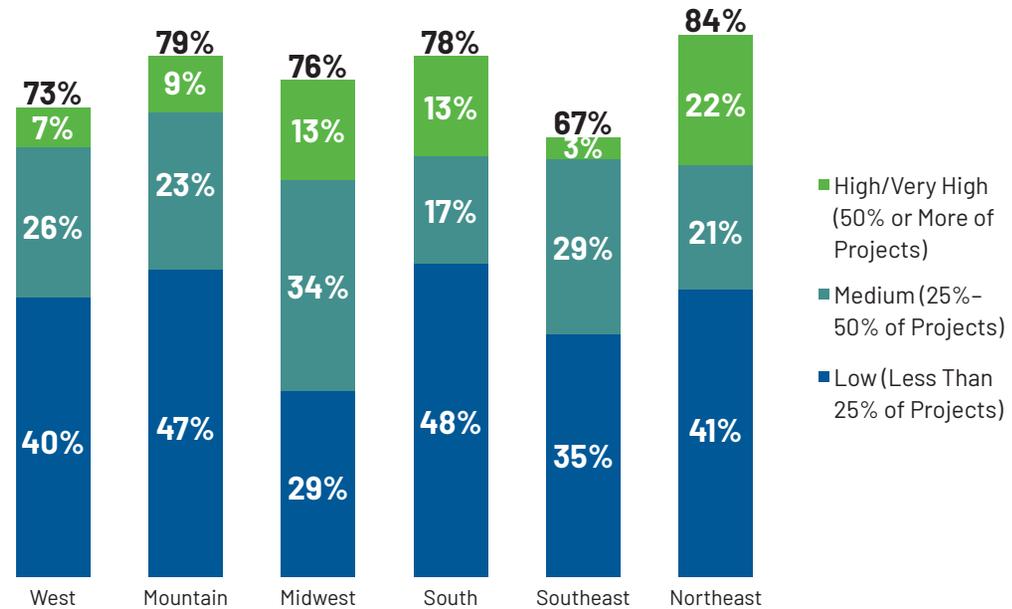
- Although there is significant variation in the incidence across regions (i.e., the percentage of a respondent's projects where automation is involved), all regions show high overall levels of process automation (67%-84%).
- The Northeast boasts the highest overall (84%) and also the greatest number (22%) reporting high or very high incidence (i.e., 50% or more of projects).

When asked to name specific elements they see being included in their projects to automate loading dock processes, several respondents identify automated shipping/receiving/handling, especially in the South and West.

The following page shows the responses to a question about the frequency of four specific automated systems at loading docks.

Automation of Operational and Handling Processes at Loading Docks

Percentage of Contractors Reporting Various Frequency Levels of Projects That Incorporate Automation of Processes at Loading Docks, by Region



Automated Equipment at Loading Docks

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AUTOMATED EQUIPMENT AT LOADING DOCKS

Respondents were asked how frequently each of the four specific types of automated equipment shown in the chart at right are being used on their projects.

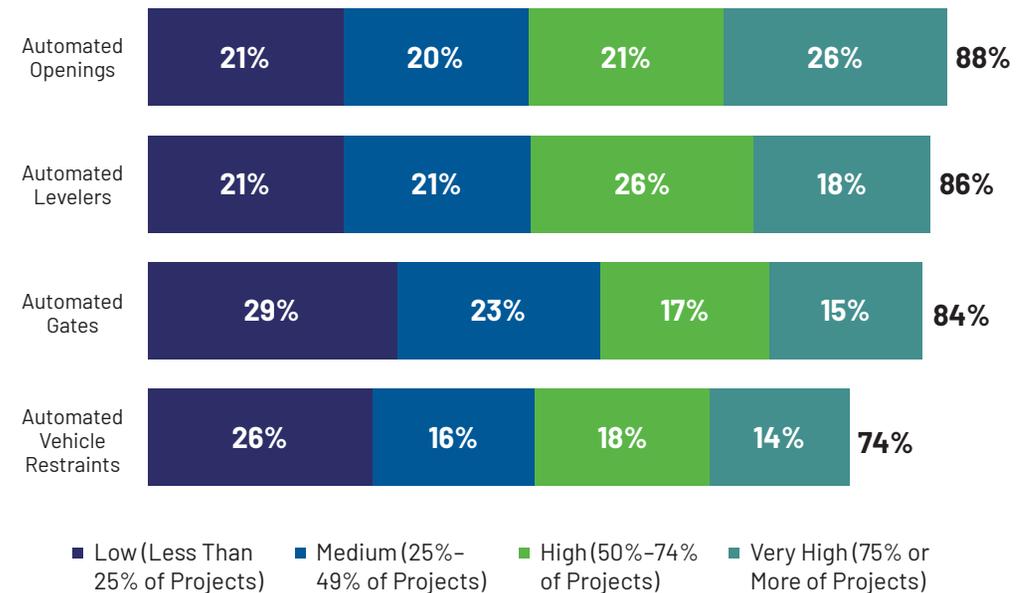
- Overall usage is generally high (74%–88%)
- The total of high and very high incidence are also impressive, ranging from about one third (32% for both automated gates and automated vehicle restraints) to nearly half (44% for automated levelers and 47% for automated openings).

Across all four types of automation, the larger companies in the respondent pool (>\$50million in annual revenue) show higher incidence (46% are high or very high) than smaller ones (36%). The same is true for the more experienced companies (i.e., those for whom warehouse/distribution projects represent a higher percentage of their practice), particularly with automated gates and vehicle restraints.

The following page shows variation by region.

Frequency of Automated Equipment at Loading Docks

Percentage of Respondents Reporting Various Levels of Frequency for Each Type of Equipment on Their Projects



Automated Equipment at Loading Docks (CONTINUED)

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REGIONAL VARIANCE

The table at right shows the percentages of respondents reporting high or very high use (i.e., use on at least 50% of their projects) for each of four types of automated loading dock equipment, divided by region. For purposes of comparison:

- Cells are shaded (darker=higher) to visually emphasize the variations across the regions.
- Averages for each region are shown at the bottom of the table.
- Total high/very high use for each type of equipment is shown in the far right column.

Highlights of the findings include the following:

- The South is highest overall and leads in automated gates and vehicle constraints.
- The greatest variance between regions occurs with automated openings, where the South leads (60%) and the Southeast significantly lags (21%).
- Another notable lag is with automated vehicle constraints in the West (12%).
- Interestingly, the West demonstrates above-average leadership with its use of automated gates (50%).

Regional Variance in High/Very High Frequency of Automated Equipment

Percentage of Respondents Reporting Each on at Least 50% of Their Projects, by Region

	Midwest	Northeast	South	Mountain	Southeast	West	All
Automated Openings	48%	52%	60%	47%	21%	40%	47%
Automated Levelers	54%	47%	52%	42%	35%	21%	44%
Automated Vehicle Restraints	35%	40%	44%	28%	26%	12%	32%
Automated Gates	28%	33%	38%	23%	21%	50%	32%
Regional Averages	41%	43%	49%	35%	26%	31%	

IT, Communications and Power at Loading Docks

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CONNECTIVITY AND POWER AT LOADING DOCKS

The needs for both digital connectivity and electric power at loading docks are rapidly increasing due to the growing sophistication and complexity of warehouse/distribution centers. To track this trend, respondents were asked how frequently each of the five elements shown in the chart at right are being included in loading docks on their projects.

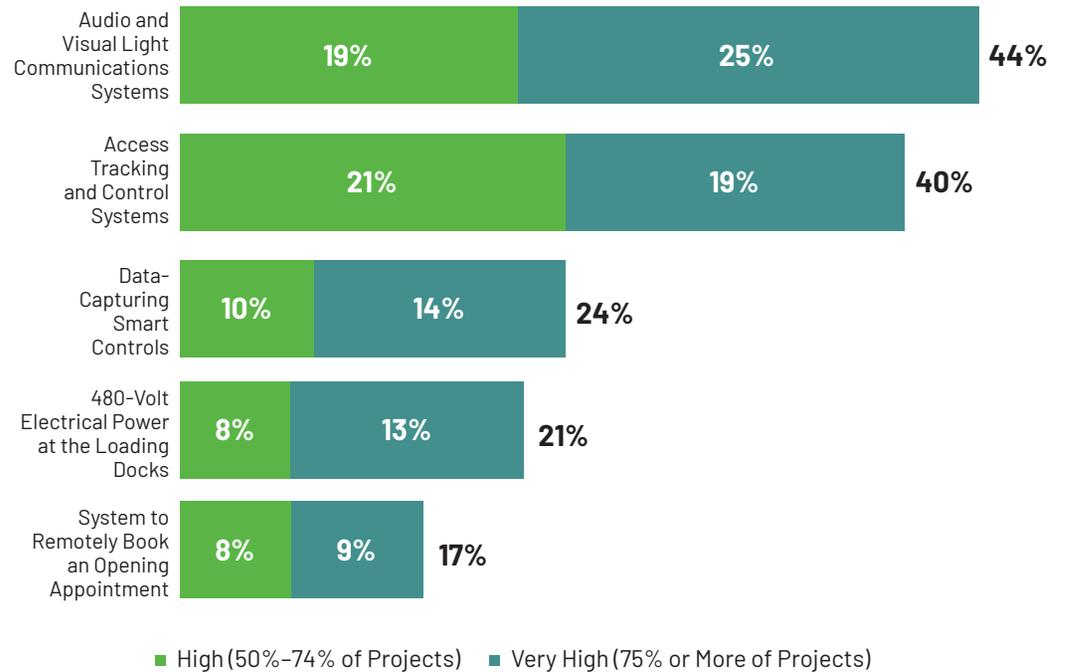
The chart shows the percentages reporting high or very high use (i.e., more than 50% of their projects).

- Nearly half are reporting the use of audio and visual light communications systems (44%) on the majority of their projects and well over one third cite that frequency for access tracking and control systems (40%).
- While the others are less frequently reported, it is reasonable to expect that each will see an increase as demands for power and connectivity at loading docks continue to advance.

The following page shows a breakdown by the six regions studied.

High/Very High Frequency of IT, Communications and 480-Volt Power at Loading Docks

Percentage of Respondents Reporting Use on at Least 50% of Their Projects



IT, Communications and Power at Loading Docks (CONTINUED)

THE CONNECTED WAREHOUSE

REGIONAL VARIANCE

The table at right shows the percentages of respondents reporting high or very high use (i.e., use on at least 50% of their projects) for each of five elements studied, divided by region. For purposes of comparison:

- Cells are shaded (darker=higher) to visually emphasize the variations across the regions.
- Averages for each region are shown at the bottom of the table.
- Total high/very high use for each element is shown in the far right column.

Highlights of the findings include the following:

- Although there is significant regional variation among some of the individual elements, the overall regional averages are relatively similar, with the Northeast (34%) leading and the Southeast (20%) lagging.
- The greatest variance between regions (32 percentage points) occurs with access tracking and control systems, where the West leads (50%) and the Southeast lags (18%).
- The Southeast also notably lags in data-capturing smart controls (9%) and a system to remotely book an opening appointment (0%).

Regional Variance in High/Very High Frequency of IT, Communications and 480-Volt Power at Loading Docks

Percentage of Respondents Reporting Use on at Least 50% of Their Projects, by Region

	West	Mountain	Midwest	South	Southeast	Northeast	All
Audio and Visual Light Communications Systems	40%	40%	43%	52%	35%	50%	44%
Access Tracking and Control Systems	50%	37%	41%	40%	18%	43%	40%
Data-Capturing Smart Controls	21%	19%	23%	27%	9%	36%	24%
480-Volt Electrical Power at the Loading Docks	17%	23%	26%	19%	18%	19%	21%
System to Remotely Book an Opening Appointment	24%	19%	18%	13%	0%	22%	17%
Regional Averages	30%	27%	30%	30%	20%	34%	

Facility-Wide* Automation of Operational and Handling Processes

(*Other Than at Loading Docks)

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FACILITY-WIDE AUTOMATION

In addition to the important focus on loading docks, a wide variety of automation, connectivity and technology elements are being designed and built into all areas of warehouse/distribution facilities. The rest of this section addresses specific aspects of that facility-wide trend.

FACILITY-WIDE AUTOMATION OF OPERATIONAL AND HANDLING PROCESSES

Respondents were asked to select the percentage range that best represents the portion of their projects where automation and connectivity are being applied in areas other than loading docks.

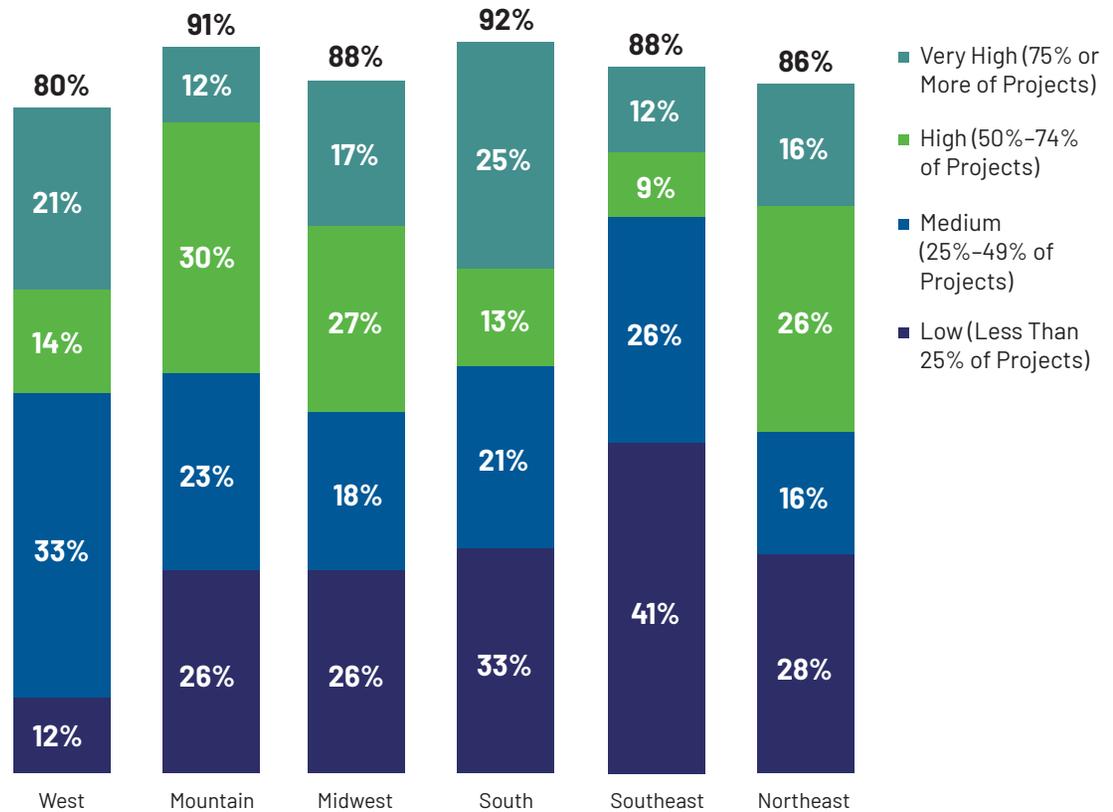
The chart at right shows the findings divided by region, all of which show a high percentage (80%–92%) reporting some level of incidence.

EMERGING USE OF ROBOTICS AND ITS IMPACT ON FACILITY DESIGN

When asked to name specific elements they see being included in their projects to automate operational processes, several respondents identify the use of robotics for merchandise handling. Some also mention improved flooring required to support more robotics. This is likely to be a growing feature of these facilities.

Frequency of Facility-Wide Automation of Operational Processes

Percentage of Respondents Reporting Various Levels of Frequency on Their Projects, by Region



Facility-Wide* IT/Communications Systems

(*Other Than at Loading Docks)

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FACILITY-WIDE CONNECTIVITY

Digital connectivity and connected systems are increasingly important throughout warehouse/distribution centers.

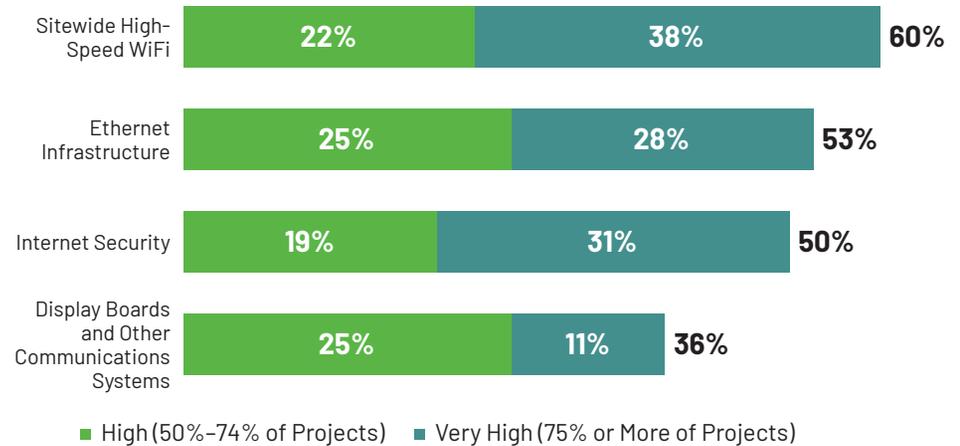
Respondents were asked how frequently each of the four shown in the chart at right are being included in the overall design and construction of their projects. The chart shows the percentages reporting high or very high use (i.e., more than 50% of their projects).

The top three (sitewide high-speed WiFi, ethernet infrastructure and internet security) are reported on a majority of projects by at least half of the respondents (50%–60%) and in each case, the largest portion of that group are citing them on 75% or more of their projects. This suggests that these are well on their way to becoming standard features of warehouse/distribution centers.

The following page shows a breakdown of the four IT/communications system features studied, by region.

High/Very High Frequency of Facility-Wide IT/Communications Systems and Controls

Percentage of Respondents Reporting Use (Other Than at Loading Docks) on at Least 50% of Their Projects



Facility-Wide* IT/Communications Systems (continued)

(*Other Than at Loading Docks)

THE CONNECTED WAREHOUSE

REGIONAL VARIANCE

The table at right shows the percentages, of respondents reporting high or very high use (i.e., use on at least 50% of their projects) for each of four facility-wide connectivity elements studied, divided by region. Highlights include the following:

- Five of the six regions show strong overall averages (45%–56%) across all four connectivity elements.
- The South is particularly strong in sitewide WiFi and ethernet infrastructure.

OTHER CONNECTIVITY ELEMENTS

Respondents were also asked to identify any other IT/communications elements not included in the list of four. Highlights from those responses include:

- Camera/video security/surveillance/CCTV, especially in the West.
- Handheld devices/charging/docking stations (walkie-talkies, etc.) and auditory/alert systems (paging, intercom, etc.), especially in the Mountain region.
- Routing/scheduling hardware/computers, and inventory tracking/control, especially in the West.

Regional Variance in High/Very High Frequency

Percentage of Respondents Reporting Each on at Least 50% of Their Projects, by Region

	West	Mountain	Midwest	South	Southeast	Northeast	All
Sitewide High-Speed WiFi	62%	58%	57%	67%	41%	64%	60%
Ethernet Infrastructure	57%	58%	50%	60%	32%	55%	53%
Internet Security	57%	40%	51%	52%	38%	57%	50%
Display Boards and Other Communications Systems	29%	26%	40%	46%	21%	48%	36%
Regional Averages	51%	45%	50%	56%	33%	56%	

The Warehouse as a Workplace

INTRODUCTION

Employers face a challenging labor market for workers in their warehouse/distribution facilities. This section of the report focuses on three building-related aspects of respondents' recent projects that can be leveraged to help attract and maintain talent.

SAFETY-RELATED SYSTEMS AND EQUIPMENT

There may be no more important consideration for employers than the health and safety of their workers. This part of the study examines the frequency of six specific safety-related features.

WORKPLACE AMENITIES

This part of the study also explores the frequency of seven types of worker amenities to acknowledge the growing role of warehouse/distribution facilities as dynamic 24-hour workplaces.

TEMPERATURE-CONTROLLED AREAS FOR WORKER COMFORT

Lastly, this part of the study also determines the frequency and extent (i.e., percentage of floor area) of temperature-controlled areas for worker comfort.



Safety-Related Systems and Equipment

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DESIGNING-IN GREATER EMPLOYEE SAFETY

Respondents were asked about the frequency on their recent projects of each of the six safety-related building elements shown in the chart at right.

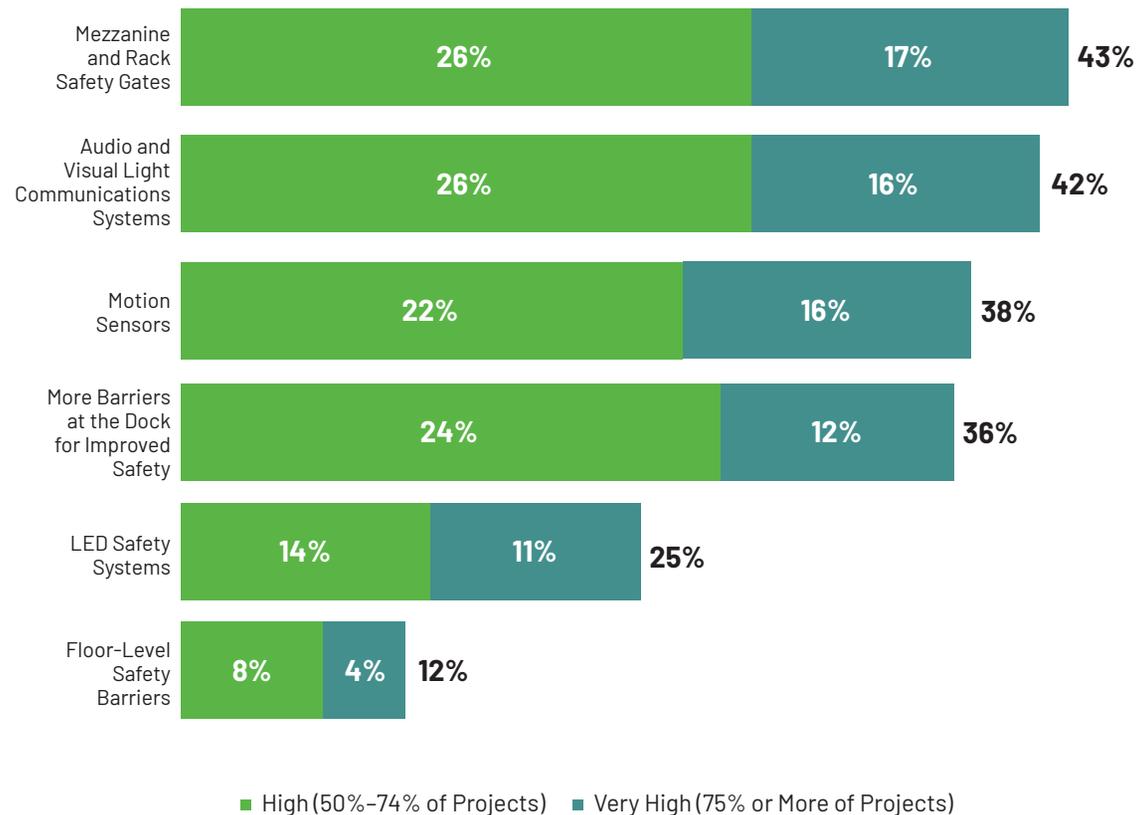
The chart shows the percentages reporting high or very high frequency (i.e., on at least 50% of their projects).

- Encouragingly, four of the six are reported at this high frequency by at least one third (36%–43%) of respondents.
- Unfortunately more of those are reporting just a high frequency level (50%–74% of their projects) rather than very high (75% or more of their projects).
- The other two elements are reported by 25% or fewer respondents and can be considered as emerging safety measures.

The following page shows variation by region.

High/Very High Frequency of Safety-Related Systems and Equipment

Percentage of Respondents Reporting Each on at Least 50% of Their Projects



Safety-Related Systems and Equipment (CONTINUED)

THE CONNECTED WAREHOUSE

REGIONAL VARIANCE

The table at right shows the percentages of respondents reporting high or very high use (i.e., use on at least 50% of their projects) for each of six types of safety-related systems and equipment studied, divided by region. For purposes of comparison:

- Cells are shaded (darker=higher) to visually emphasize the variations across the regions.
- Averages for each region are shown at the bottom of the table.
- Total high/very high use for each type of system/equipment is shown in the far right column.

Highlights of the findings include the following:

- Four of the six regions fall in a very tight range (33%–36%) at the top end of the rankings.
- The greatest variance between regions (25 percentage points) occurs with motion sensors, where the Midwest leads (51%) while the Southeast lags (26%).
- A similar gap (24 percentage points) can be found with more barriers at the dock for improved safety, where the South leads (48%) and the Southeast trails (24%).

Regional Variance in High/Very High Frequency of Safety-Related Systems and Equipment

Percentage of Respondents Reporting Each on at Least 50% of Their Projects, by Region

	West	Mountain	Midwest	South	Southeast	Northeast	All
Mezzanine and Rack Safety Gates	45%	35%	45%	42%	26%	52%	43%
Audio and Visual Light Communications Systems	38%	42%	48%	48%	26%	41%	42%
Motion Sensors	48%	30%	51%	35%	26%	31%	38%
More Barriers at the Dock for Improved Safety	31%	37%	34%	48%	24%	40%	36%
LED Safety Systems	26%	16%	26%	29%	15%	31%	25%
Floor-Level Safety Barriers	12%	7%	13%	8%	12%	16%	12%
Regional Averages	33%	28%	36%	35%	22%	35%	

Employee Amenities

EMPLOYEE AMENITIES

As warehouse/distribution facilities become workplaces for a rising number of employees, owners and operators are realizing the importance of expanded and enhanced amenities to attract and retain a high-quality workforce.

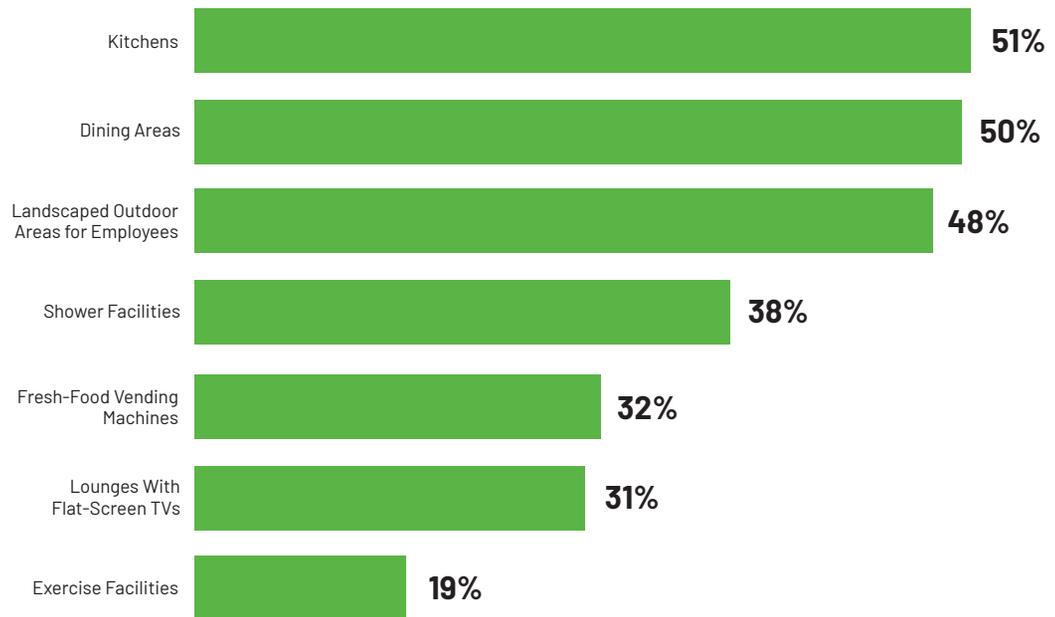
Respondents were asked to identify which of the seven amenities shown in the chart at right have become more important to their clients over the last five years.

- The top three amenities are identified by about half (48%–51%) of respondents, suggesting they can be expected as standard in most projects going forward.
- With a broad-based focus on employee health and wellness gaining traction among many US employers it can be expected that the incidence of fresh-food vending machines and exercise facilities will both grow in warehouse/distribution projects.

The following page shows variation by region.

Increased Importance of Employee Amenities

Percentage of Respondents Reporting That Each Has Become More Important on Their Projects During Last Five Years



Employee Amenities (CONTINUED)

THE CONNECTED WAREHOUSE

REGIONAL VARIANCE

The table at right shows the percentages of respondents reporting increased importance of each of the seven types of employee amenities studied, divided by region.

Highlights of the findings include the following:

- The overall averages for the six regions are in a reasonably tight range (33%–44%) suggesting that this is a nationwide trend impacting all facility owners and operators.
- Within the top three amenities, the greatest variance between regions (20 percentage points) occurs with dining areas, where the Mountain region leads (58%) and the Southeast trails (38%).
- The largest gap among the other amenities (30 percentage points) appears with shower facilities, where the West leads (45%) and the Southeast lags (15%).
- A similarly large difference (29 percentage points) occurs with fresh-food vending machines, where the Midwest leads (50%) and the South ranks last (21%).

As the labor market continues to tighten for workers in all industries, it is reasonable to expect that employee amenities will increase in warehouse/distribution centers as a way to compete for workforce talent.

Regional Variance in Increased Importance of Employee Amenities

Percentage of Respondents Reporting Increased Importance of Each During Last Five Years, by Region

	West	Mountain	Midwest	South	Southeast	Northeast	All
Kitchens	48%	44%	50%	44%	56%	59%	51%
Dining Areas	43%	58%	56%	46%	38%	53%	50%
Landscaped Outdoor Areas for Employees	50%	53%	52%	50%	41%	41%	48%
Shower Facilities	45%	42%	40%	40%	15%	34%	38%
Fresh-Food Vending Machines	26%	23%	50%	21%	29%	31%	32%
Lounges With Flat-Screen TVs	19%	40%	35%	25%	38%	29%	31%
Exercise Facilities	17%	14%	23%	19%	12%	22%	19%
Regional Averages	35%	39%	44%	35%	33%	39%	

Temperature-Controlled Areas for Employee Comfort

CONDITIONED SPACES FOR WORKER COMFORT

Respondents were asked how frequently they are designing and building conditioned spaces in warehouse/distribution projects to improve worker comfort. As a follow-up question, they were asked what percentage of the floor area is typically being conditioned.

FREQUENCY

The chart at upper right shows the percentages of respondents who report including conditioned spaces for worker comfort on the majority of their projects, by region.

- There is significant variation, led by the Mountain region (51%), while the Southeast trails (21%).
- Encouragingly, the percentages reporting very high frequency (75% or more of projects) exceed those at just a high level (50%-74% of projects) in four of the regions.

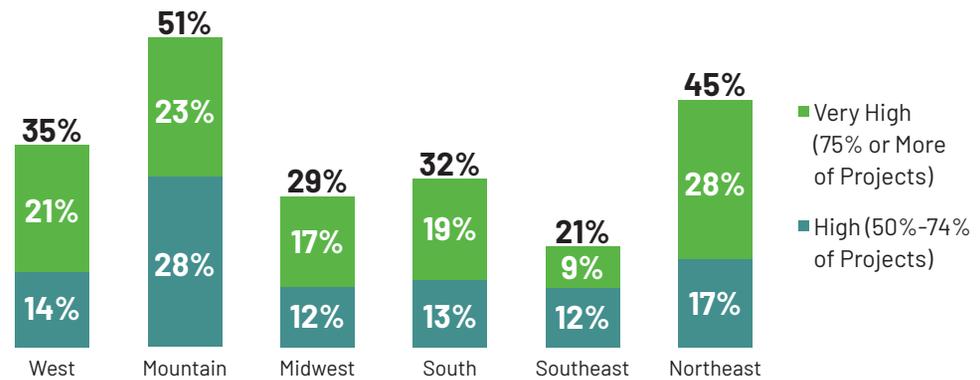
EXTENT

The chart at lower right shows the range of responses related to percentage of floor area devoted to conditioned space, also by region.

- The findings are similar to those for frequency.
- The very high percentage respondents exceed the high percentage ones in just three of the regions, although two of those are the overall category leaders (Mountain and Northeast).

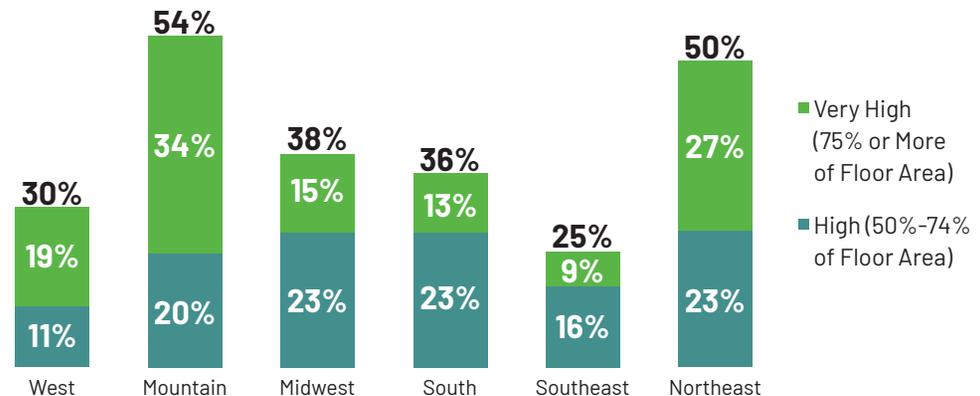
Frequency of Temperature-Controlled Areas for Employee Comfort

Percentage of Respondents Citing High or Very High Incidence in Their Projects



Amount of Floor Area That Is Temperature-Controlled

Percentage of Respondents Citing High or Very High Amounts of Floor Area



Thought Leader Interview



Tripp Eskridge

Managing Director of Project Management, CBRE

Tripp Eskridge is a veteran project management executive with more than 30 years of experience managing the design and construction process for industrial facilities and in-plant engineering.

The survey findings show that the top drivers for warehouse and distribution facilities include the need for greater flexibility to meet demands and changing product lines, along with accommodating higher inbound/outbound volumes. Does that align with your experience?

ESKRIDGE: It does, and to a greater extent than I've ever seen in my career [of over 30 years]. The exciting part is that there are a dozen things that drive the demand, and all of them are accentuated right now. Company reactions to the supply chain issues we've been experiencing for the last year and a half to two years are pretty much aligned across the board: "I've got to be able to manufacture local," which means they need local inbound logistics facilities, they need local outbound logistics and they need local distribution facilities. All these things are aggregating and driving an unprecedented surge in our industry. So both the demand is higher and the complexity is greater, which means that different types of facilities are required. It's a very exciting time to go through ... It's all about speed and client service



There are a dozen things that drive the demand [for warehouse and distribution facilities], and all of them are accentuated right now

because when [a customer] pushes the button on their phone or on an app, they want [their order] to show up at their doorstep as quickly as possible. Or if the plant in, say, Vietnam is not producing, you need a buffer of inventory until you can develop local manufacturing. These things are driving the complexity of different types of facilities.

Consider automated facilities and bulk distribution facilities that are nonautomated. [To determine the level of automation needed], that's a math equation. It is a balance of the space CapEx and labor. I can spend more on equipment to shrink my footprint and reduce my labor cost, or I can spend less on equipment, increase my footprint and increase my labor cost, or I can increase the height of the building with automation. But what's the right answer? Optimizing the balance of space CapEx and labor is what drives those decisions, and that's different for each of these nodes of operation and distribution.

Thought Leader Interview (CONTINUED)



I see higher-quality loading dock equipment more and more often due to the desire to improve safety as an employer of choice.

The research shows that there is a growing need for more temperature-controlled areas. Does that align with your experience?

ESKRIDGE: [That increased demand] has to do with food safety, and it also has to do with the desire to be an employer of choice. I don't understand it as increased demand. Are there more humans eating more food, or eating different types of food or a greater variety of food? There is a need for meeting food safety standards and compliance issues. Older, outdated facilities may have a hard time accomplishing that compliance. So we see companies modernizing for food quality.

[Another driver is to become] the employer of choice. Rather than saying, "I'd like to hire you to work in a minus-10-degree freezer all day," they say, "What if we modernize that facility? We automate the cold storage operations and minimize the time that you spend in that minus-10-degree temperature." And the full end of the spectrum is to totally automate the cold areas and only have workers in the warmer areas.

What we are seeing is a migration to companies that specialize in cold storage. Smaller operations have trouble making the investment to



It's a great feeling to walk into a warehouse that has a [high] level of illumination, and it doesn't cost anything other than the initial installation cost [for skylights and LED lighting]. This level of light increases safety and security.

modernize their facilities, but a larger operation can invest more. So what we are going to see is an aggregation of those clients.

And the last part is that companies, particularly in the grocery sector, don't want to deal with the employee turnover. They may say, "I'm going to outsource labor because it is not a core competency or value add. We'd rather focus our time on the retail side of our grocery industry because that's where we make our money. Let's leave distribution to the specialists." So we see in grocery a trend toward outsourcing to a specialized cold storage provider.

Has the increase in the need for temperature-controlled areas had an impact on project schedule or cost, or created supply chain issues?

ESKRIDGE: For refrigeration systems, we [increasingly consider the option of using] a modular system instead of a centralized plant. You pick up the entire refrigeration system, you ship it already preassembled to the site, and then you connect it. The way those systems are designed minimizes some of the cost of a central plant that requires, sometimes, having a full-time onsite safety and maintenance person who will operate those systems to keep the general public safe. So the cost of running a central plant is expensive. They're redesigning those to be modular. And ultimately, what that means is there's a supply chain constraint on those types of systems. The designs are improving, but the best systems are really long-lead items [12 to 18 months], and companies have to place those orders early.

Thought Leader Interview (CONTINUED)

THE CONNECTED WAREHOUSE

What are your clients doing to make their loading docks as high-tech and functional as possible?

ESKRIDGE: I see high-quality loading dock equipment more and more often due to the desire to improve safety to be an employer of choice. The old system was a mechanical spring tensioned dock leveler that you used your human body weight to articulate, to extend and to retract the leveler. More people now are using pneumatic and hydraulic levelers because they're safer, and employees like using them more.

[We also see use of] the safety features like the safety lips on the dock, where they prevent drive-offs. You have the red/green lights so that you have to interlock with the trailer, making sure the vehicle restraint is engaged to hold the trailer to the dock, so you don't have drive-aways and employees at risk of injury. You've got the dock seals that have varying degrees of success in how well they insulate the environment for keeping the rain, cold and heat out. All those things create a safer, better work environment, because that really is the critical point of your distribution facility. More companies are investing to make these facilities easy to use and making them as safe as possible.

What else do you see clients doing to improve security and safety in their facilities?

ESKRIDGE: The biggest area for me is daylighting and lighting of the facility. Instead of 10- to 12-foot candles of light in older facilities, new designs have the LED lights with higher levels of illumination, 25- to 30-foot candles. The technology that really matters to me, though, are skylights, especially the prismatic lens skylights. If you have 2% coverage of skylights in an open bulk warehouse, you get about 60-foot candles of natural light. Illumination levels of 60-foot



Now, I'm seeing a commitment, a desire and a willingness to spend money on sustainability... We see more focus from our clients on the environment, being a good corporate citizen and driving sustainability.

candles are good for reading, and it's a very natural, well-dispersed light. It's a great feeling to walk into a warehouse that has that level of illumination, and it doesn't cost anything other than the initial installation cost. This level of light increases safety and security, to have that visibility. That's really the key to me.

The other idea that comes to mind is improvements to forklift technology. They have blue spotlights that act as an advanced warning, and they have shutdown systems. If they bump something, it will disable the forklift and allow for training before the employee can operate it again.

What do you see clients doing to attract and accommodate more workers in their facilities beyond what we've already talked about?

ESKRIDGE: It's the first thing we talk about when we're setting up the program for the facility. We want to understand from our clients, what's their vision? It begins with branding. We want to know when someone walks into the facility whether they want the facility to have the look and feel of their brand. It could be sustainability is a part of their brand

and their vision and their statement of who they are. It can also just be general employer of choice options for workplace amenities.

Some of the things we've already talked about [are part of these decisions], but it's also things like outdoor employee areas, which can have screening, rooftop shading,

grills, landscaping and landscape lighting and walls that allow for seating areas. We've done basketball areas and picnic areas. People want fresh air and natural light, and it's a fun thing that doesn't cost that much to do. Inside the facility, it is fun to bring the brand into the office place as we've

Thought Leader Interview (CONTINUED)

done with a sporting goods distribution facility, with 10-yard markers and hash marks in hallways so that you feel like you're walking down a football field, and information screens that were set up like a megatron in a basketball arena. Fun stuff that says we're not just any company, we're a sporting goods company, let's bring that into our design in our environment, so that it just gives us a sense of our purpose and who we are.

We do a lot of work around workspace strategy of how the employees interact in the office ... We start with a data-driven solution that says let's look at the card access, let's survey the employees. How many one-on-one meetings do you have, how much time do you spend on emails? How much time do you spend in the office? We look at how the business functions and how they want to function. More companies are setting that vision and allowing that space to have something that's really attractive for the employees, and they're fun to be a part of.

What other advances do you expect to see in warehouses and distribution facilities over the next few years?

ESKRIDGE: Sustainability is the biggest trend that I'm seeing right now. People have talked about sustainability for a long time, but it's never really had a major foothold in the industry. Now, I'm seeing a commitment, a desire and a willingness to spend money on sustainability, including more solar fields, both rooftop and ground-mounted, wind turbines, cogeneration, more insulation in the roof, more efficient mechanical systems and water conservation. We see more focus from our clients on the environment, being a good corporate citizen and driving sustainability.

[Some customers now ask] "Where's my power coming from? From green energy or a coal plant?" That is now considered during site selection: to select a site based upon the energy provider is becoming more common these days.

Anything else we haven't discussed that you think is an important trend in this industry?

ESKRIDGE: The biggest topic of today is the schedule and the time to get things done ... To do a good job after COVID [with setting up your network], you've got to make a lot of changes in your supply chain in your network to your facilities. The shortages are driving a requirement to change that. It's hard to get steel, PVC, roofing materials, mechanical systems. Companies need to come to grips with the need to allow for the time to make these changes to their networks and plan in advance. And [they need to know] that if you go into this environment in a hurry, if you're behind schedule, trying to accelerate the pace of a project today is ultra-expensive. It is not just a small incremental charge of an extra 5% to do this faster. It is now a 30% premium or more to try to accelerate [your project] because everybody's in a jam. Everybody's having issues getting materials. If you try to get to the front of the line, when everybody's trying to get to the front of a line, it's just that much more expensive.

Design and Construction Trends

INTRODUCTION

This section of the report examines three key aspects of the design and construction process for warehouse/distribution facilities.

OWNERS' DECISION-MAKING CRITERIA

This part of the study explores priorities behind owners' design and construction decision-making from a focus on first cost to a longer-term life cycle perspective.

DESIGN AND CONSTRUCTION TECHNOLOGIES

In parallel to the rapid advance of technology and connectivity in warehouse/distribution projects, architects and contractors are also engaging in digital processes to design and build the facilities.

PROJECT TEAM FORMATION CRITERIA

This part of the study examines the relative importance of four specific qualification factors to general contractors when they are evaluating bids from trade contractors on warehouse/distribution projects.



Owners' Design/Construction Decision-Making Criteria

THE CONNECTED WAREHOUSE

OWNER PRIORITIES

Respondents were asked which of the three options below best describes the decision-making priority of the majority of their warehouse/distribution facility clients:

- Initial investment is more important than lifecycle cost.
- Initial investment and lifecycle cost are equally important.
- Lifecycle cost is more important than initial investment.

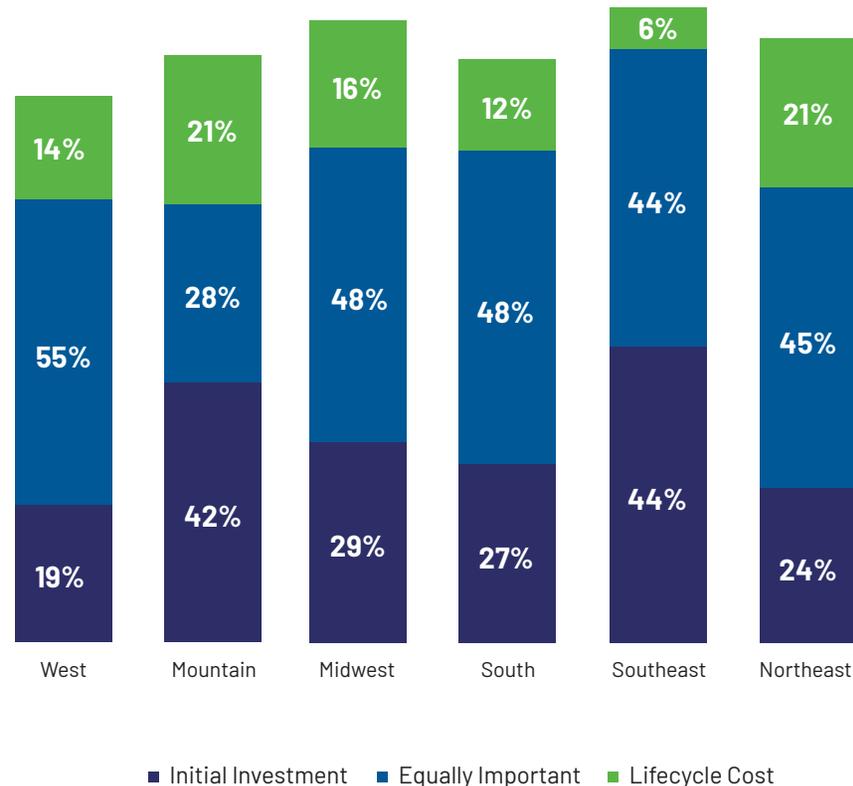
The chart at right shows the findings divided by region. (Those who responded "Not Sure" represent the missing portions of the 100% totals.)

The findings generally reflect a balanced perspective, with the share who consider initial investment and lifecycle cost equally important generally the highest and averaging 45% across all regions, although the Mountain (42%) and Southeast (44%) regions notably lean toward first cost.

Interestingly, 40% of architects cite a first cost priority overall versus just 23% of contractors, which may reflect their more prominent role in initial design decisions.

Owners' Primary Design and Construction Decision Criteria

Percentage of Respondents Reporting Each Type of Owner Priority, by Region



Design and Construction Technologies

USE OF THREE TECHNOLOGIES

Architects and contractors are using a wide variety of technology solutions to improve their performance and outcomes. To track the use of some of these for warehouse/distribution facilities, respondents were asked to identify the percentage range of warehouse/distribution projects where they deploy each of three types shown in the chart at upper right.

The chart shows the percentages of architects and contractors who are using each at a high or very high frequency.

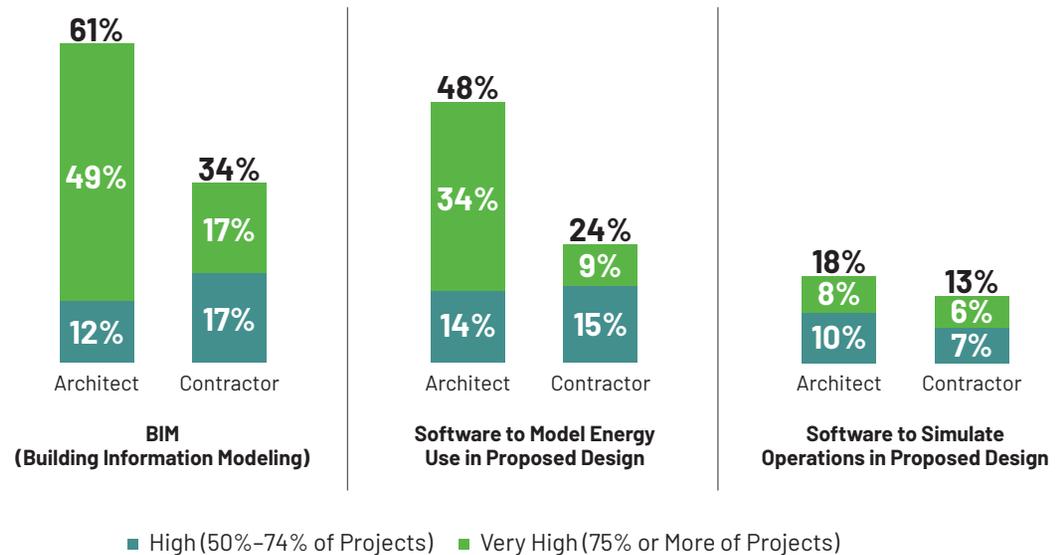
- Each of the three is used more frequently by architects, largely because they tend to focus on the design stage.
- BIM (building information modeling) is becoming a standard practice in the industry, which is particularly reflected in the high percentage of architects (49%) who report using it on 75% or more of their projects. The table at lower right breaks BIM usage out by design and construction phases.

REGIONAL VARIANCE

The table at lower right shows the highest and lowest regions for use compared with the average across all regions who are using each technology on 50% or more of their projects.

Frequency of Using Technology for Design and Construction

By Size of Respondent Company



	Highest Region	All Regions	Lowest Region
BIM (Building Information Modeling) Used for Design	West 64%	45%	Southeast 32%
BIM (Building Information Modeling) Used for Construction	West 54%	40%	Southeast 22%
Software to Model Energy Use in Proposed Design	West 48%	33%	Southeast 18%
Software to Simulate Operations in Proposed Design	West 29%	16%	Southeast 6%

Project Team Formation

IMPORTANT QUALIFICATIONS FOR TRADE CONTRACTORS

General contractors rely heavily on specialty trade contractors to execute specific portions of the overall work on warehouse/distribution facilities. General contractor respondents were asked to rate the relative importance of each of the four qualifying factors, shown in the chart at upper right, when they are considering a trade contractor for a project.

The chart shows the percentages of general contractors who assign high or very high importance to each.

- While this may be influenced by current workforce shortages in construction, the ability to commit resources ranks as more important than cost.
- Also possibly reflecting current material shortage issues, a trade contractor’s relationships with key suppliers are deemed important by 76% of general contractors.

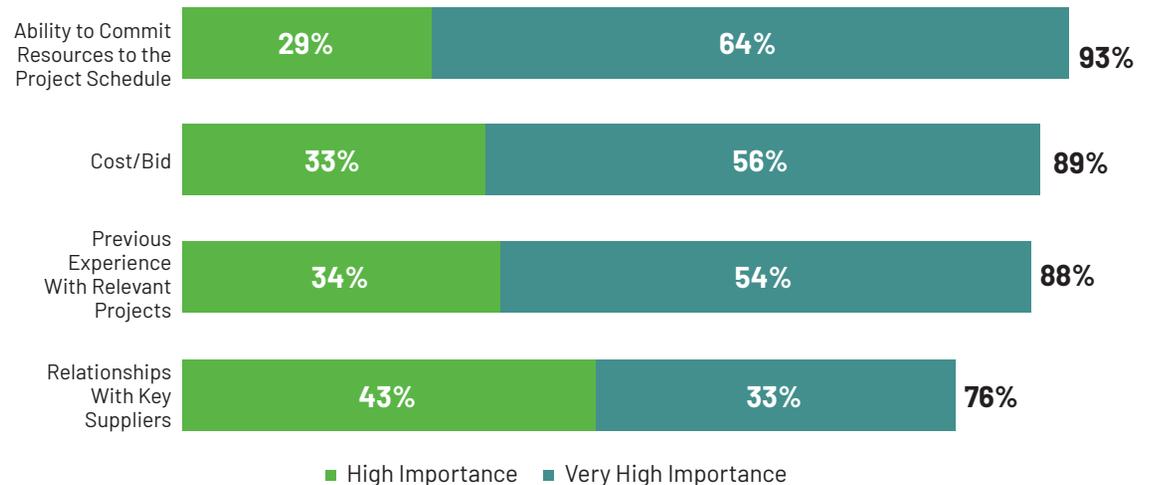
REGIONAL VARIANCE

The table at lower right shows the highest and lowest regions compared with the average high/very high importance across all regions.

- Labor shortages are clearly at a critical level in the South, where 100% of respondents rate that as highly important, while the West (67%) is notably lower than average (93%).

Importance of Specific Factors to General Contractors When Evaluating Bids From Trade Contractors

Percentage Identifying Each Factor as Having High or Very High Importance



	Highest Region	All Regions	Lowest Region
Ability to Commit Resources to the Project Schedule	South 100%	93%	West 67%
Cost/Bid	Mountain 92%	89%	Midwest 84%
Previous Experience With Relevant Projects	Midwest 92%	88%	Northeast 69%
Relationships With Key Suppliers	Southeast 92%	76%	West 67%

Key Findings

INTRODUCTION

The warehouse/distribution center market is booming. This study examines several overall trends associated with this growth and looks deeply into the automation and connectivity features being designed and built into these facilities. It also explores ways in which they are accommodating a growing workforce in a competitive labor market. Lastly, it baselines design and construction decision-making criteria, team formation and technology use.

MACRO PROJECT TRENDS

Top factors driving investments in warehouse/distribution facilities include the need to respond to higher volumes, changing product lines, fluctuations in demand and evolving business models. Also influential are providing value-added services and improving safety, security and workplace amenities.

Urban locations are increasing in frequency and now represent more than half of respondents' projects in some regions.

Sustainability is important, with high percentages of owners interested in minimizing both energy use and operational waste in their facilities as well as creating zero-carbon buildings. Many are also seeking LEED certification and incorporating a wide variety of green products and materials.



All regions studied report a recent upsurge in the percentage of projects in or near urban areas.



Percentage of owners interested in creating zero-carbon facilities.

AUTOMATION AND CONNECTIVITY

To handle growing volumes of inbound and outbound traffic more efficiently, high levels of automation and digital connectivity are being designed and built into loading docks.

- 77% report automation of operational and handling processes at loading docks.
- 74%-88% report installation of four types of automated equipment at loading docks.
- 60%-79% report data-capturing smart controls, A/V and light communications or access tracking and control systems.

Automation and IT/communications systems are also being implemented throughout entire facilities.

- Over three quarters cite facility-wide automation of operational and handling processes, and security and access control.
- 73%-82% identify each of four types of IT/communications systems going into their projects.



Percentage of respondents reporting automated levelers being installed at loading docks.



All regions report high frequency of facility-wide automation of operational and handling processes.

Key Findings (CONTINUED)

THE CONNECTED WAREHOUSE

THE WAREHOUSE AS A WORKPLACE

Respondents report that they are including more features to help owners and operators attract, retain and support a growing workforce.

- Over 80% cite each of four key elements to improve employee safety on their projects.
- All nine of the employee amenities studied are being incorporated more frequently than they were five years ago.
- 94% report inclusion of temperature-controlled areas for greater employee comfort, and among those, 40% say they represent at least half the floor area. This varies significantly by region, however, with the Northeast and Mountain states leading and the Southeast notably trailing.



Percentage of respondents reporting their clients place a high priority on employee safety when planning their facilities.



All regions report increases in a wide variety of employee amenities.

DESIGN AND CONSTRUCTION TRENDS

Owners' criteria for design and construction decision-making range from 30% who report a primary focus on first cost to 15% who say their clients prioritize a lifecycle perspective. The others take a blended approach.

Several technologies are shown to be gaining significant traction among architects and contractors doing warehouse/distribution projects, including:

- BIM (building information modeling)
- Software to model energy use
- Software to simulate operations in the facility to be built

Contractors rated the relative influence of several factors when evaluating bids from specialty trade contractors. Reflecting the current labor climate, the most important is the ability to commit adequate resources to meet the project schedule.



Although owners vary greatly between those focusing on first cost versus lifecycle when making design and construction decisions, about half are reported to take a reasonably balanced approach.



Percentage of respondents reporting that BIM (building information modeling) is used for the construction phase of their projects.

Methodology

Dodge Data & Analytics (Dodge) conducted The Connected Warehouse study to baseline important trends in the rapidly growing US market for warehouse/distribution facilities. The report is based on a national survey of architects and contractors who are involved with the design and construction of these facilities.

ABOUT THE SURVEY

The survey was developed by Dodge for approval by Chamberlain Group. Dodge then fielded the survey online from September 22 to October 10, 2021.

- The survey sample was drawn from Dodge’s Contractor Panel and Architect Panel.
- To participate in the survey, respondents had to be involved in warehouse/distribution facility projects during the last five years, otherwise they were screened out.
- 314 construction professionals completed the survey, comprised of:
 - 290 contractors (54% general contractors and 46% specialty trades)
 - 124 architects
- Respondents’ average project mix is 75% new construction and 25% renovation/upgrade work.

REGIONAL DISTRIBUTION OF RESPONDENTS

To provide a national perspective, respondents were sourced from six regions of the US shown in the table at right.

- Companies that work in multiple regions were asked to identify the one in which they perform the most work and to respond to survey questions based on their projects in that region.
- Variances in findings between these regions are referred to throughout the report.
- Findings in the report that do not refer to a specific region represent all 314 respondents.

Name of Region and Percentage of Total	States Included in Region
West (13%)	Oregon, Washington, Alaska, California, Hawaii
Mountain (14%)	Minnesota, North Dakota, Iowa, Idaho, Montana, Nebraska, South Dakota, Wyoming, Colorado, Utah, Arizona, New Mexico
Midwest (27%)	Wisconsin, Michigan, Illinois, Indiana, Kentucky, Ohio
South (17%)	Kansas, Missouri, Arkansas, Louisiana, Oklahoma, Tennessee, Alabama, Mississippi, Texas
Southeast (11%)	North Carolina, South Carolina, Georgia, Florida
Northeast (18%)	Connecticut, Rhode Island, Maine, New Hampshire, Massachusetts, New York, Vermont, Pennsylvania, New Jersey

Contacts & Resources

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ADDITIONAL RESOURCES



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