



# Choose the Best Type of Monitor for CAD

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When you consistently spend long hours working at a computer monitor, the details matter: adjustability, size, and resolution can affect your comfort and productivity. But with new technologies increasing the number of options available, it can be difficult to determine what would suit you best. To help you select the right monitor for your needs, representatives from four manufacturers discuss important considerations for CAD users.

# Choose the Best Type of Monitor for CAD

When selecting a new monitor, you may quickly become overwhelmed by options. Experts from four vendors share their knowledge to simplify your search.

*Editor's Note: This guide was published for the first time in 2017. This 2020 edition contains all-new guidance provided by industry experts.*

From the editors of

**cadalyst**

*For more than 30 years, Cadalyst has delivered insight and advice to help our readers optimize the software and hardware that power the CAD workflow.*

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It's an essential part of your workday, and you spend long hours staring at it — and no, it's not the box of doughnuts on your desk. We're talking about the window to your work: your computer monitor.

The importance of a good monitor is obvious. Whether you're looking at 2D or 3D CAD projects, complex simulation results, photorealistic renderings, or a simple spreadsheet, it's crucial that you can see details clearly, multitask as needed, and make it through the day without exhausting your eyes.

But deciding on a particular model is not as clear-cut. Although some elements are nearly universal now — you'll very likely be buying a liquid-crystal display (LCD) monitor with an in-plane switching (IPS) panel and light-emitting diode (LED) backlighting — some are not. To help you choose the right monitor for your needs, representatives from four well-known manufacturers — [BenQ](#), [Lenovo](#), [NEC Display Solutions](#), and [ViewSonic](#) — shared their perspectives on the most important considerations for CAD users.

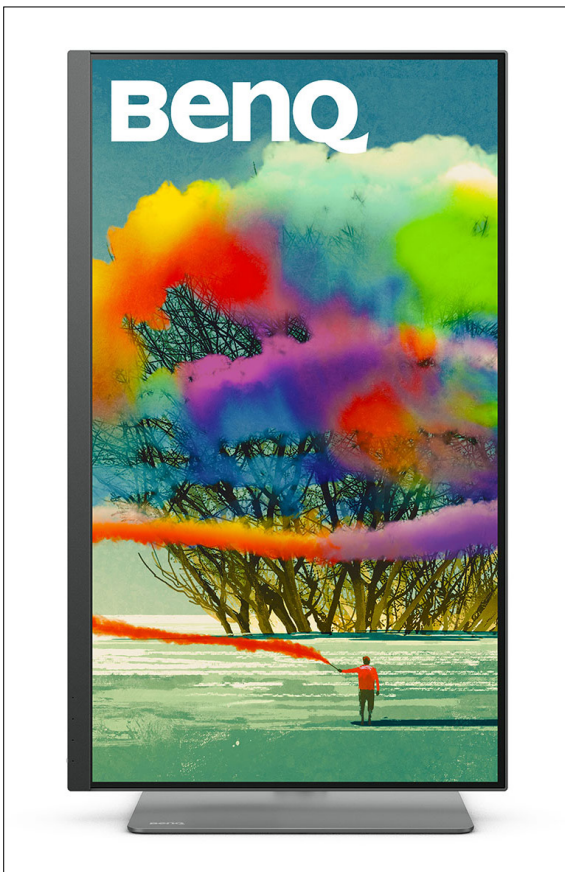
## The Magic Number of Monitors

Although single-monitor setups are common, many professional users increase their digital desktop size by expanding to two monitors — or more. Some split a single CAD or other application across multiple screens; others prefer to use one screen for CAD, and others for office applications, simulation software, etc. But what's the right number for you?

According to Chris Ruffo, AEC & Product Development Segment Lead, Lenovo Workstations, CAD users typically prefer two flat-screen monitors to maximize real estate for modeling.

Ruffo was not alone in suggesting two screens. "If there's enough desktop space, we recommend a dual-monitor setup for more working space," said Jason Lee, LCD Product & Marketing Manager, BenQ America. "Two 27" is the balanced size for a dual-monitor setup. With the capability of height adjustment, tilt, swivel, and screen pivot, users can adjust their monitor to fulfill their daily needs. For example, you can set up one horizontal display and one vertical display with ease," he said.

"CAD programs are highly complex and put many tools at the user's disposal," noted Kevin Christopherson, Director of Product



» BenQ's PD2720U is a 27" 4K UHD Thunderbolt 3 monitor that can rotate between horizontal and vertical orientations.

*"Bigger is better, as long as it fits in your workspace and fits your desired monitor configuration"*

Marketing at NEC Display. "In some cases, the user can move the interface for these tools to a secondary screen, which leaves more real estate on the primary screen for the user to view their workspace. Sometimes the user will also want to view reference material, and if they aren't overlapping that image with their workspace, they will want to have it off to the side on another screen."

Not all users are moving to multi-monitor setups; some are choosing bigger instead of more. "Depending on the user's preference, some prefer two or more monitors, while others prefer a single 38" ultrawide monitor," observed Ray Hendrick at ViewSonic.

### Selecting Size and Shape

Monitor size is measured diagonally, from one corner of the viewing area to the opposite corner. *Aspect ratio* is the relationship between the horizontal and vertical dimensions, expressed as *h:v*. The combination of these two factors dictates how much visual real estate you have to work with.

"Most CAD apps are optimized for 16:9, and some apps like Revit work well with a 16:10 aspect ratio," Ruffo pointed out.

Lee recommended at least 27" with a 16:9 aspect ratio, or 34" with a 21:9 aspect ratio. "It depends on your preference," he said.

"Due to the high resolution, 27" and above is ideal, with many users opting for larger 32" 4K UHD displays," said Hendrick. "Many CAD programs are optimized for 16:9, but multiple viewpoint configurations allow for 21:9 use as well."

When deciding on the number and size of monitors, keep in mind the limitations of your workspace, as well as your daily needs. Will your monitor require space on your desk, or can it be mounted on the wall? How close to the screen do you typically sit?

"Bigger is better, as long as it fits in your workspace and fits your desired monitor configuration," said Christopherson. "I highly recommend a wide aspect ratio if the user intends to use a single display setup, so that the tools and workspace can be laid out efficiently."

**Factor in the form factor.** For units larger than 27", a curved screen can help you take in the full width of the screen without constantly moving your head side-to-side like someone watching a tennis match. It can also limit the viewing angle, however, and some users who are used to flat screens find it annoying. (In an ideal world, you would always evaluate a monitor in person before you buy, but doing so is especially important if you're considering a curved model.) Note that curved monitors can be substantially more expensive than flat models of the same size.



## Angling for a Good View

In normal use, the monitor and the person viewing it are arranged perpendicularly. The *viewing angle* indicates how far you can stray from 90 degrees before the image becomes too dark, blurry, faint, etc. to see. Although the primary user will typically sit directly in front of the monitor, additional collaborators will have to sit off to the side, or stand over the owner's shoulder and look down on the monitor. If others frequently need to view your screen, viewing angle is an especially important consideration.

"Viewing angles should be wide," Hendrick stated. "For flat monitors (both 27" and 32"), having a wide viewing angle (178 degrees) is key ... so that [users] can work, and share their work knowing that the image and colors are consistent with what their partners/clients are seeing. For curved monitors, make sure that you have a comfortable curvature; typically 1800R to 2300R is ideal for working, and is not as extreme as some gaming monitors (1500R). Keep in mind that curved monitors may affect how the image is viewed, depending on the user's viewing position," he pointed out.

"Wider is better," Lee declared. "Color accuracy is important for professional users; a wider viewing angle can reduce color shift and make sure what you see on the screen is accurate," he explained. "The typical viewing angles of an IPS panel are 178/178. It can fulfill the need for CAD professionals' use."

**Don't waste time on response time.** This is the amount of time it takes for pixels in the display to change in response to input, measured in milliseconds (ms); long response times can cause blurriness. Fortunately, "response time is not that important for CAD users," said Lee. "Normally, a monitor that features less than 15-ms response time will be fine for CAD users," he said.

As Hendrick explained, "Graphical content creators work in large files, with high-definition imagery. Because of its size, rendering an



» For a dual-monitor setup, Lenovo recommends its 24" ThinkVision P24h-20, which provides integrated speakers, integrated Ethernet, 75W of USB-C charging, and QHD resolution.

*“Response time is usually not a major factor with CAD workflows”*

image, file, or video tends to take more time. Therefore, response time is not usually a major concern for CAD work.”

Ruffo concurred: “Response time is usually not a major factor with CAD workflows, so monitors with less than 7 ms tend to be sufficient. Many monitors with extremely low (1- to 2-ms) response times tend to use TN panel technology, which sacrifices color and viewing angles in order to achieve that pixel speed; modern IPS panels, which offer greater color and viewing angle support, tend to fall between 4–6 ms. Overall, the value of a good IPS panel will give the best experience, and the typical 4- to 6-ms response time gives the end user a monitor that can quickly adjust colors when new images are being drawn onscreen, without sacrificing color quality and viewing angles.”

Christopherson also downplayed the importance of these criteria: “For CAD, a fast response time and wide viewing angles are nice features to have, but aren’t as critical as some other features. Most users who aren’t playing video games won’t notice the difference in response time when comparing a fast and relatively slow display. ... Most commercial-grade displays will have perfectly adequate response times and viewing angles.”

### **Resolution: There’s More Than One Right Answer**

Resolution describes how many columns and rows of pixels make up the display, typically written as width (number of lines of pixels counted from side to side) x height (counted top to bottom). The technology has moved far beyond high definition (HD); quad-HD (QHD) and ultra-high-definition (UHD; also called 4K) models are widely available. And the choices don’t end there: “2,560x1,440 (2K QHD) or 3,840x2,160 (4K UHD) are ideal, although if you choose to go with an ultra-wide 21:9 display, then QHD+ (3,840x1,600) is also a great way to get as many pixels on the screen as possible,” Hendrick explained.

QHD, defined as 2,560x1,440 pixels at a 16x9 aspect ratio, has four times the pixels of HD. This standard is sometimes recommended over higher resolutions such as UHD, because greater pixel density increases sharpness, but it can make icons, menus, and other CAD essentials appear smaller.

“In the past, there was an argument that a higher resolution could be problematic because it would shrink certain elements of the interface to annoyingly small size,” recalled Christopherson. “I don’t think that’s the case anymore, because most software developers have made it easy to scale the interface regardless of the display resolution. A higher degree of clarity is desirable for users to visually inspect the project, and for that reason, I recommend a higher resolution,” he continued.

“Based on current content and design trends, we recommend at least QHD resolution — of course, UHD will be better,” said Lee. “With higher resolution, you can get better viewing clarity and more working space. More working space means that you’ll be able to arrange all your tool panels in your software flexibly,” he noted.

*“With higher resolution, you can get better viewing clarity and more working space”*

Ultimately, the right resolution “varies with different use cases,” Ruffo said. “Some users who work in wireframe mode for modeling can often get away with a full HD monitor; others who perform a variety of solid modeling, BIM, and visualization will want 4K. However, most CAD/BIM users will benefit from a 4K monitor.”

### Connections and Comfort

When you’re deciding on a monitor, it’s easy to get caught up in specs and overlook the human factor. Be sure that your monitor is comfortable for you to use, so you don’t suffer unnecessary eye-strain, headaches, or neck pain.

If you ever use the monitor in dim or dark environments, look for bias lighting to reduce contrast between the glowing screen and the darkened room. If your workplace is bright and glare is a concern, you may prefer a matte screen to a glossy one.

Some users find the light from the monitor itself to be a source of discomfort over time; if you’re one of them, look for a unit with blue light-filtering technology, to help reduce eyestrain linked to that particular wavelength. (There are also inexpensive aftermarket products available that address each of these issues.)

**Connections that count.** “Seamless connectivity between mobile workstation, dock, and displays is critical for a good experience,” Ruffo noted. “Connectivity to a quality camera, as well as speakers, makes for better communication both in the office and at home. Also, it’s good to have a wide range of connectors, including HDMI, DisplayPort, and USB-C, to make it easier for plug-and-play connectivity with current and legacy hardware,” he said.

Christopherson said, “The desktop display is the central piece of a larger solution. Buying the right display is important, but it’s also important to remember the other elements, such as the mount and color calibration tool. For a professional-grade solution, it’s best to work with an integrator who has partnerships with all of the leading manufacturers so that they can provide the best possible overall solution for your needs.” He also advised buyers to ensure the displays they select have the latest connectivity options (DisplayPort, HDMI, USB Type-C), to provide flexibility in the case of computer updates.

“There has been a slow shift over the past few years to more powerful laptops replacing the traditional desktop,” Hendrick noted. “However, desktops are still more powerful than laptops, and [that form factor] is still the system of choice for power users. For laptops, it is the USB Type-C, single-cable connection, which can deliver power to the laptop (and charge it) while transferring video, sound, and data at the same time. If you are using a desktop tower, then DisplayPort will work just as well as USB-C, and since both the monitor and desktop tower are stationary at the desk, it doesn’t matter which cable is connected,” he explained.

“The current state of the monitor market is one where USB-C connectivity is more highly sought after, especially for creative pros like graphic designers or CAD users,” Lee commented. Buyers should look for versatile connectivity, he recommended. “Nowadays, more

*“Seamless connectivity between mobile workstation, dock, and displays is critical for a good experience”*



» *A multi-monitor setup gives the user more flexibility in arranging the work environment; tool interfaces or reference materials may be positioned on a secondary screen, for example. Image source: Gorodenkoff/stock.adobe.com.*

and more desktops/laptops support the latest Thunderbolt 3 and USB-C. Please do take advantage of one cable connection (supports charging, data transfer, and video signal simultaneously). Also, if you plan to set up dual monitors, Thunderbolt 3 also supports daisy chain function: You can chain your second monitor to your first monitor through one single cable.”

### **Specialized Visual Workflow Needs**

What about those professionals involved in creating renderings of CAD designs, printing product visualizations, or any similar tasks?

“For this kind of professional’s work purposes ... they need a monitor to display their work with precise color accuracy,” Lee stated.

“Where color accuracy is a factor, users should look for displays with the widest possible color gamut,” said Christopherson. “Color-accurate displays also need to be calibrated for their workspace, which is much easier when calibration tools and devices are packaged with the display. If the user needs multiple color-accurate displays, it’s also immensely helpful to have a system that calibrates color across multiple linked displays to guarantee consistency,” he continued.

“A quality 4K monitor with wide color gamut support will be enough for the average CAD user creating a range of visualizations, from still images to complex walkthroughs. Visualization agencies creating cinematic-quality films will look for solutions with more complex color calibration, HDR, and dynamic color gamut support,” Ruffo said.

Hendrick said, “CAD professionals need displays with high resolution, brightness uniformity, and high contrast, [that are] color accurate in the sRGB color space. Although Adobe RGB is an option, it is

not required, since CAD imagery is typically displayed in electronic format, which has standardized in sRGB.”

### Lifespan Expectations

You may have heard that workstation manufacturers recommend an upgrade every three years. When it comes to monitors, there is more variation in recommendations; the unit may still be perfectly functional after that amount of time, but technologies are evolving so rapidly that available performance improvements may call for an upgrade.

“A professional display should be an investment that lasts for many, many years,” Christopherson advised. “As such, you should consider the quality of components that the manufacturer is putting into their product. You should also consider the warranty being offered (in years and usage time), and the manufacturer’s reputation for quality and customer service. Do they have a history of working with customers to resolve issues quickly? Do they provide fast service and exchanges? Do you see any reports from other users about reliability issues with the product? These important factors transcend the user’s budget, and should apply to a manufacturer’s value and high-end products [alike].”

As Lee said, “The durability for a monitor can last for a long period of time. In addition, a good monitor ... will definitely boost your working efficiency. Thus, it’s recommended [to] choose the flagship product that fulfill your need. You can get the benefits from it for the coming five years, at least. If there are budget limitations, a single monitor with accurate color will do the job.”

Ruffo advocated syncing monitor and workstation upgrade cycles. “With technology (color management and gamut, display connectors, interfacing with smart office peripherals, etc.) changing quickly, CAD users should consider upgrading their displays every few years — ideally, when they upgrade their workstations,” he advised. “This will maximize productivity and connectivity with team members, whether in the office or at home.”

» *If you will use your monitor in dim surroundings, make the contrast between bright screen and dark room easier on your eyes by using bias lighting mounted on the back of the monitor. Image source: amenic181/stock.adobe.com.*





When comparing models, keep an eye on warranty details. Hopefully your new monitor will give you years of flawless service, but know how the manufacturer will resolve issues, should they arise.

### Keep an Eye Out for Tech Evolution

Although monitors may seem to be a mature technology, new features, trends, and events will continue to impact the market.

“One of the latest trends in the industry has been to find ways to integrate functionality that would typically be on a dock, into the monitor itself,” Ruffo observed. “In a new normal where many of us are working from home, consolidating features into a single device to save desk space and eliminate clutter can really help users feel more productive. If you are considering buying a new monitor that will give you the best value for the longest amount of time, it’s important to consider features like USB-C power delivery capability and [determine which] extra features, like a USB hub for peripherals, or integrated Ethernet, will help best increase your productivity and simplify your workflow. As always, it’s dependent on the user, but given the current work climate, having a monitor that provides flexibility can really help keep you prepared for any changes that may impact how you work,” he said.

Hendrick noted, “As CAD work continues to expand from professional offices to even an individual in a garage/home office setting, there is a growth potential in the maker and hobbyist community for people that want to invent and create useful items at home, made possible by better access to 3D printing tools/services and CNC machining with professional levels of fit, finish, and quality. The democratization of manufacturing will require a democratization of CAD work, in our view.”

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