



Buyers Guide for LED Indirect tennis lighting

Buying LED indirect lighting can be a very complicated endeavor requiring you to become technically savvy and knowledgeable about how electronics work. It is also a significant long-term purchase/investment. Like it or not you pay for what you get these days and it applies the LED Lighting you will likely purchase. While LED lighting systems very attractive, and energy savings significant an uninformed decision can be a costly one as. Just like buying a car or any major purchase there are considerations you should be informed before any final decisions are made.



Below are questions you need to ask EVERY LED vendor you talk to regarding them and their LED products.

1. Is the LED fixture designed, Tested and certified for indirect lighting use?

This is one of the most important questions, the answer is likely “NO” as there are only few fixtures available that have been certified for indirect use and most LED sales people have no idea this distinction even exist. If they say yes then you should ask for a copy of the certifications that discloses it as specifically certified for indirect use. The organization that certifies LED fixtures in North America is the Design Light consortium (DLC) and you want to make sure the fixture has the DLC certification for “**Specialty Highbay Indirect**”. Additionally, the LED fixture is required to be safety certified by either **UL, ETL or CSA** and the certification document should show it was tested and certified for indirect use.

Why is this so important? Heat is the #1 killer of electronics, the most important design element of all LED lighting is the “heat/thermal management”. Most LED fixtures are designed to aim down at the floor are engineered for the heat to likely escape through the back of the fixture; be it with vents or aluminum heat sinks, now invert that fixture up at the ceiling, since heat rises those vents and or heatsinks are now on the bottom of the fixture and now marginalized since the heat will naturally rise towards the LED’s (away from the heatsinks) and/or be trapped in the Driver cavity likely causing the driver to run warm/hot. This can be a huge problem for most LED fixtures designed to aim down, as that fixture may likely operate warmer/hotter than it is designed for, thus potentially reducing the life of the LED components or causing premature catastrophic failure of the LED’s or Driver (not limited to smoke and fire even). Without these certifications you might as well put your money on the roulette wheel as safety, performance, and estimated LED life are total unknowns regardless of what the salesperson says. Without these certifications in the event of a catastrophic incident these could be a major liability if you install LED fixtures in a manor they are not designed or certified for. The lack of proper certification would also likely void your insurance if the insurance company discovered that you installed LED fixture improperly.

THERE IS A REASON THESE CERTICATIONS EXIST...

Any LED you purchase the vendor should be able to provide you a copy of the DLC certification as well as the UL, ETL, or CSA certification, and note that the word INDIRECT must be inclusive in the physical certification.

All Brite Court LED indirect fixtures have both DLC and CSA safety certifications specifically for indirect use). Below are the certification documents (DLC on the left and CSA on the right, you can also substitute UL or ETL as these are the three acceptable safety certification in North America) for the Brite Court LED HEX indirect, notice that Indirect is the certification category for DLC and also notice that Indirect is in the disclosed in the CSA safety certification.

Model# DID-HEX24I-8400-50K-U-NC-XX-D10-XX

Manufacturer: 1st Source Lighting
Brand: 1st Source Lighting
Technical Requirements Version: 4.2
Date Qualified: 10/25/2017
Product ID: P03YAP4P

Specified Indirect Certification

General Application: High-Bay
Primary Use: Specialty: Indirect High-Bay

Main: Indoor Luminaires
Classification: Standard
Is Parent Product: No
DLC Family Code: UUUJBEQ
Dimming Status: Dimmable
Listing Status: Listed

Reported Data | Zonal Lumens | Spacing Criteria | Version History | Family Data

Light Output: 62178.1 lm
Wattage: 405.9 W
Efficacy: 153 lm/W
Power Factor: 0.99
CCT: 5000 K
CR: 84
Total Harmonic Distortion: 12 %

CSA Group
Supplement to Certificate of Compliance

Certificate: 70074531 Master Contract: 262911

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History		
Project	Date	Description
70146296	2017-09-08	Update report to add alternate LED module manufactured by Samsung Electronics Co. Ltd., model SI-B8xS21560WW.
70074531	2016-05-27	cCSAus certification of Indirect, Suspended-mount luminaire, intended for dry location, model DID-HEX24I.

This shows that the LED HEX is Safety Certified for Indirect use. With out a specific Indirect Safety Certification No LED fixture should be used Indirect

NEVER ACCEPT ANY LED INDIRECT FIXTURES WITHOUT DLC and CSA/UL/ETL INDIRECT CERTIFICATION

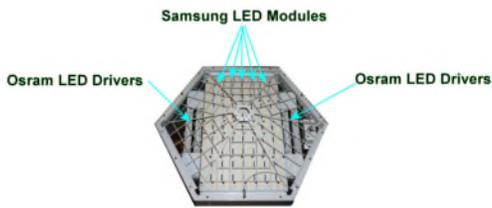
2. What is the MAX operating temperature of the LED fixture?

All electronics including LED lighting have a published rated **MAXIMUM** operating temperature. It is Important to know what the max operating temperature is and the high potential ambient temperatures on your facility. For example your indoor tennis courts on an 80 degree day assuming you are not air conditioned, the ambient ceiling temp could potentially reach 90-110F. If your facilities summer ambient temp is near the max publish temp of the fixture you are likely in the danger zone of permanently damaging the fixtures electronics or catastrophic failure. LED's typical max temps range from the low end 40C (104F), to the higher end of 50C (122F), naturally you want an LED fixture with a high Max Temp rating (you should avoid any LED fixtures with a Max temp of 40C or below. That is often a sign of poor design and older technology).

Max Temps are published in part to allow the manufacture a way out of the warranty if the fixture fails due to warm operation. When an LED fixture fails the failed components are evaluated by the manufactures and in most cases they are able to determine if heat was the cause of the premature failure. Every LED component manufacture we are aware of have warranty stipulation regarding operation that causes the LED's and drivers to fail. This is where having LED fixture tested and certified in the indirect orientation is so important as you know the limitation of the fixture when used in that orientation. Whereas taking a LED down light and inverting it you only know the limitations in the down orientation, most Led fixture designed to aim down, when inverted up will run warmer. A 10-20 degree increase in the operational temps of a LED fixture can reduce the life by 20%-50% or more. So take any fixture life sales pitches as pure speculation.

This link is to an article from the NLPPI Lighting Research Center
<http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/led/heat.asp>

Brite Court LED indirect fixtures are designed and engineered exclusively for indirect use and all Thermal (heat) management is for indirect orientation to efficiently dissipate heat in the orientation.



Pictured Left is a pictured left is the **Brite Court LED HEX indirect** fixture. You can see that the LED's are located in the center of the fixtures, and the LED drivers are located on the outer two side of the LED modules. So logic tells you that any heat generated by the Drivers or LED modules easily rises up and away from the fixture and no heat is EVER transferred between the LED's and driver.

Pictured right is a fixture that is designed to aim down and the most common design is the LEDs are on the bottom and the driver is in the back/top of the fixture. The Driver that generates the most heat and is most affected by heat, this location allows the heat to dissipate through the heat sinks in the back of the fixture. So picture that LED fixture instead of aiming down, it is now aiming up, these heat sinks on the back are no longer effective and all that heat is trying to rise up however the LED's Modules are in the way and since the LED modules are a composite material this will likely trap heat. So for indirect lighting this is a disaster waiting to happen. Note While there are many styles or LED down light this principal applies to most.



3. **Should I consider LED Indirect fixtures with fans (active cooling)**

It cannot be stressed enough how heat impacts your LED lighting investment. While most LED fixtures do not require fans to cool the components, you will see some LED indirect fixtures that require fans to prevent them overheating. Fans are used for two reasons either they are trying to compensate for the above pictured issue or the fixture has a lens over the LED's which is the kiss of Death for any LED indirect fixture unless you add cooling, this is called **Active Cooling**. Here is what you should consider with active cooled LED indirect fixtures, one would think that having an additional cooling mechanism in your LED fixture is a good thing, that could not be further from the truth as fan cooling is a feature that is used to overcome or disguise fixture shortcomings.

If a fixture requires fans to cool their components this likely means that the fixture simply runs too hot and is in danger of catastrophic failure or a limited life span without the fans. The consideration for active cooled LED's is the fan is simply another component to potentially fail and/or maintain, and if that \$10+/- computer fan fails likely does your expensive LED fixture. Unfortunately you will not know there is a failure till it is too late since the fixture is 20'-50' in the air and there are no safe guards. If the fan fails the fixture will continue to run until it overheats and at that point damage is done. Fans in an Led fixture is just another component to eventually fail. It is no different than your computer, if your fans fail and you ignore them the components of your computer will also fail or likely be damaged. Besides potential higher maintenance cost and risk one of the big complaints with fan cooled LED fixtures is the hum of the fans, while fans are considered mostly silent, collectively they often are not, If you are looking to get away from the hum of your old Metal Halide fixtures, fixture that are fan cooled will not have silent operation (recently an Ivy League School removed LED's they installed that had fans as the hum was annoying, they intern installed silent Brite Court LED Hex fixtures.

LED indirect fixtures that do not require fans and have passed all thermal testing and indirect certifications are likely to yield less maintenance and longer life as well as operate silently.

4. **How easy is it to clean and maintain your investment**

You hear the words "low maintenance" or "maintenance free" often thrown around with LED, this can be marginally true at least with LED's that are aimed down assuming they are in a clean environment. With indirect lighting regardless of technology, the fixtures **need to be periodically cleaned**. Anyone who has ever changed an indirect lamp or a fixture in an indoor tennis facility can attest to the level of dirt build up that collects on every surface and lighting fixtures. *Pictured Right: is an Indirect Halide that was removed however there was about 1/2" of bugs and dirt built up after 2 years since cleaned*



It seems like every thread of ball fuzz and every dead bug somehow finds its way on and into indirect lighting fixtures. It used to be cleaning was recommended because dirt build up blocks the light output of the fixture, however with LED it is a matter of life or death of your LED fixtures. While dirt does reduce light output the bigger problem with LED is it creates a thermal blanket on the LED components. This increases the operating temperature of the LED's and Drivers which discussed above is detrimental. With that said ALL LED indirect fixtures should be cleaned every 1-2 years. This includes the LED diodes/modules as well as the LED drivers, so it is very important that the fixture you purchase allows for easy and quick access to all components. Note: if drivers are located in the fixture body you need to be able to open to clean. Also those fan cooled LED indirect fixtures, while the fan blows air out over the components to cool them they are also drawing air in as well as all the airborne dirt into the fixture. With cleaning so critical consider the cleaning process, if the fixture must be dismantled to access drivers and heat-sinks, cleaning can become very time consuming and costly. Anyone that suggest cleaning is not needed has little experience with indirect tennis lighting systems. Understand it is not dirt in the fixture that is the problem however it is the dirt on the LED modules and Drivers that create the problem and whether or not the fixture has a lens it requires cleaning as dirt also insulates a lens as well as blocks light output.

5. Do you want a Lens over the LED's

This plays into the above discussions, it would seem logical to have a lens however the lens complicates the overall performance and life of the LED's and drivers. Recall we discussed heat management and we need heat to easily escape the fixture, any lens just adds to the lack of thermal management. While a lens is a non issue on down lighting (this is because the heat rises away from the LENS) whereas one an indirect fixture the heat would rise towards the lens which will contribute to trapping the heat preventing it from escaping the fixture, this will result in LED's and Drivers operating hotter then they should. This is why most if not all the indirect fixtures that have lenses also require FANS. Brite Court has tested lenses extensively and we refuse to use fans in our fixtures to cool them. Besides what is the advantage of a lens... NONE... Even a clear lens reduces light output.

Regardless with or without a lens the fixture needs to be cleaned as mentioned above. Also note that a lensed fixture will have vents into the driver cavity requiring you to dismantle the fixture to clean the drivers. Some LED indirect fixtures require significant dismantling to access the driver and fixture cavity making maintenance a night mare. This should be a major consideration. There is nothing about having a lens that is an advantage.

6. What are the Fixture mounting options?

There are 3 typical LED mounting scenarios

- A. Pendant mount where the fixture is suspended on a Stem/conduit
- B. Cable mount Fixture is suspended by a single point cable
- C. Fixture is mounted on a Unistrut raceway



A well thought out fixture will accommodate all of these options. One of the pitfalls out there to watch out for is the systems that use several low wattage fixture mounted to a short unistrut or metal platform, these are often cable mounted. These are usually imported LED down lights that are low performance and because it takes multiple fixtures to replace one of your metal; halides they simple put several on a short strut. These are often budget minded Led fixtures that are not certified for indirect usage. Also note that the companies that offer this often cut corners and try to install them on a single point cable. What happens is the fixtures start spinning and end up in odd positions. See the picture below most of the fixtures have twisted and it looks very sloppy.

7. What is the REAL Life of the LED's?

This is a loaded question that NO LED salesperson or manufacturer for that matter can precisely determine as the answer is very subjective. In fact the DOE (Department of Energy) recently published an LED Failure report that showed that the **Lifetime claims for more than ½ of LED products to be inaccurate.** Remember all that discussion above about heat, dirt, indirect, direct as well as thermal management; well those are the contributing factors of the life of your LED's (aside from quality of the components and fixture design). Excessive heat and dirt can easily cut the fixture life in half or worse. LED fixtures go through extensive testing to determine baselines for life and performance, however those baselines are established based on optimal controlled environments and mostly determined based on thermal management of the fixtures and being accelerated test they are subjective at best. What published LED end of life suggest is the point where the light output falls below 70% (assuming there is no failure prior), this is NO basis for how long the LEDs will actually last before failing, are you confused yet?

You will see reference to L70 reports that shows hours of life till 30% depreciation (or 70% maintained lumen/light output) occurs and often these life expectancy numbers are 50,000 to 200,000 hours, these test (L70) are done in a very controlled and consistent environments at 25C (77F) whereas a warmer (even slightly warmer) environment can have a significant negative impact and accelerate the LED's depreciation and or failure rate. Again these life ratings do not take into consideration the quality of the LED chips in terms of their reliability and or catastrophic failure rate. The L70 testing may say 100,000 hours however you may have several to many fail in a few hours, few months, few years well short of the rated life. Again, the dirt, ambient temp and heat sinking of the fixture will greatly determine the life, so there is no hard-fast baseline for reliability in your installation. However generally speaking the LED's are the most reliable part of the fixture, the Driver on the other hand is the weakest link. This is why serviceability and warranty are so critical. It is likely not a matter if you have to replace LED modules or drivers in the future it is about when. Unfortunately most LED fixtures the LED modules are not replaceable whereas you must remove and replace with a whole new fixture.

Brite Court LED fixtures are all 100% field serviceable, our Led modules can be quickly replaced in about 3 minutes time

8. What is the expected life of the LED Driver?

This is the discussion that no one talks about with the consumer. LED drivers have a typical **life of 50,000-60,000 hours.** Whenever you see LED life published that typically has nothing to do with the LED driver life. Since Led modules typically last longer than the drivers that is what the consumer is most often told the life is, the driver life is omitted as it is the weakest link of any LED system. The LED driver to the LED lamps is like the ballast to a fluorescent lamp. Basically, LED drivers convert higher voltage; alternating current to low voltage that the LED operates on, it is a key element of the LED system. However as mentioned above it is also the **weakest link.** Drivers often fail prematurely due to high internal operating temperatures. Battery-like components called **electrolytic capacitors** are often the cause of failure. Electrolytic capacitors have a **gel inside** them that gradually evaporates over the lifespan of the driver. High temperatures speed the evaporation of the gel and shortens the life of the capacitor, causing the driver failure, and hence your fixture failure. So the life of your drivers will mostly be determined by heat management, hours of operation as well as quality of manufacturing and internal components (not all drivers are created equal).

What you should realistically expect for Driver maintenance. These are generalized projection for ALL LED fixtures as a whole?

- first 5 years 1%-3% driver failure.
- 5-10 years more frequent failures another 1%-10%
- 10-15 years likely total driver replacement (assuming 10-16 hours per day of operation).

The LED Modules themselves should have a much smaller failure rate and longer life.

Like the LED Modules the Brite Court LED fixtures the Drivers are 100% field serviceable and it takes about 3 minutes to change a driver

9. Are the LED fixtures 100% field serviceable?

In the inevitable event you do have to service your LED fixture, ask can the servicing be done with the fixture in-place or does it need to be taken down to be service? Many fixtures require that you send it back to the manufacture for any warranty of component replacement or even throw it away and replace the whole fixture. That can be very problematic since you have to rent the lift, remove the fixture, then be without and then when it is sent back to you then get another lift and re-install the fixture. Ask can anyone with basic skills service or replace components on the fixture? Often LED fixtures are not easy to service/repair (like taking apart and repairing your own cellphone). It is important that the driver and LED's are wired with quick disconnects (plug or push-button connections) and easily serviceable and accessible. The last thing you want if they are serviceable is to have it so complicated that you have to hire an electrician or electronics specialist to service the fixture every time because at \$75-\$150 an hour that can get expensive.

Brite Court LED fixtures are 100% field serviceable, in fact we ship every order with spare drivers and LED modules for future maintenance if needed. This also simplifies any warranty claims, and eliminates any wait time for replacement components. Our LED components are from two of the largest most reliable LED lighting manufactures in the world; Sylvania and Samsung, while their LED components are very reliable all LED manufactures have a small acceptable failure rate. We just simplify the process by sending spares if you ever need them.

10. What is the availability for replacement parts for servicing the LED fixture?

This is very important, assuming the fixture is 100% field serviceable (or say the drivers are replaceable). Many fixture manufacturers use proprietary components, they may have drivers made special for them, or LED modules specific to the shape of their fixture, and this means if you need replacement parts in the future be it in warranty or out of warranty you may be held hostage by that specific manufacture. With so many LED fixtures if that manufacture goes out of business or simply stops making what you need your fixture might just be a throw away and a loss. Many of the LED fixtures currently are coming from Asia, however very few are being stocked in the US. Almost all are built to order and then shipped for the project. That goes for replacement parts as well. If your fixture is foreign manufactured you will likely have to go direct to that international manufacture for parts and it will likely be very time consuming and or delayed. It would be a disaster if your LED lighting system started having failures and you could not domestically replace the components. You need to know that you can buy what you need domestically with or without the fixture manufacture. It is recommended whatever LED fixtures you buy that before purchasing you do a dry run of the process.

11. How do I make a Warranty Claim and Who Backs the Warranty?

Any warranty is only as good as the company that backs it... Again company integrity comes into play. You need to have a detailed discussion and a dry run of the warranty process, including all contacts, phone numbers and emails. I recommend calling the manufacture (not the sales vendor) to discuss the warranty and process; do not rely on just what the salesperson tells you. Once they are gone you are on your own. One last thing that relates back to the heat management and cleaning. Max temps are published as a threshold, if the fixture fails due to high ambient temps or a dirty environment that cause premature failures warranty is likely to be voided, even though your LED fixture has failed it still holds data that can be retrieved by the manufactures that may determine the cause of failure, and this is the #1 reason for voided warranties. Also make sure that the manufacture acknowledges specifically that the fixture is covered by warranty when used indirect, their warranty should disclose "Indirect use" in the warranty.

Be careful there is a company selling LED indirect fixtures, the fixtures are not certified, nor will the OEM manufacture honor the published warranty. Instead the vendor is providing their own warranty. This is concerning, if the manufacture will not honor the warranty and does not recommend indirect use of their fixture, why would you buy it regardless if the vendor offers a warranty, this is problematic from the start.

The Brite Court LED HEX has a 10 Year warranty from a 26 Year Old USA Manufacture

As you can see there is a lot to consider and being knowledgeable and asking the right questions can help you make an informed decision. When you consider the cost of the Led lighting systems it simply cannot be an impulse purchase otherwise there can be significant financial risk.