Title: REMOTE LIGHTING DESIGN SYSTEM

Abstract: A lighting design system for selecting non-traditional and traditional lighting by at least one remote user via electronic data transmission connection, preferably via the Internet, from at least one remote computer with an application server provider (ASP) having a server computer and general lighting software, fiber optic lighting software, and business support software installed on at least the server computer for permitting at least one remote user to access the software. The at least one remote computer includes a display device for displaying a series of interconnected windows presented by the software. The fiber optic lighting software includes algorithms and calculations for automatic conversion of units of an amount of light from Watts to lumens and vice versa thereby enabling the at least one remote user to consider lighting designs in traditional and non-traditional lighting without performing manual calculations. Notably, live links are embedded in the software and displayed on at least one remote screen for at least one remote user of the system, whereby selection to the live links by the remote user connects the remote user to a window presented on the remote screen displaying detailed product specifications and information provided by a manufacturer of products represented by the live links.
REMOTE LIGHTING DESIGN SYSTEM

Background of the Invention

(1) Field of the Invention

The present invention relates generally to lighting design and, more particularly,

to a remote system for lighting design, including lighting source(s), connections, and
fixture(s). Further, the present invention relates generally to an electronic commerce
method of doing business for architectural, design, and engineering plans.

(2) Description of the Prior Art

Lighting designers and architects influence the buyers of all lighting products.

Buyers of lighting products typical follow the lighting plan provided by these designers
and architects. Typically, lighting design is performed by lighting designers and
architects, usually operating in a small firm or solo practice. As such, expensive software
is not reasonably practical for purchase and in-house use for lighting design.

The prior art includes lighting design software that function merely as calculation

software programs, for example Lighting Technologies, Inc. makes LUMEN MICRO
software and Genlight makes GENESIS software, which are commercially available for
purchase and use by lighting designers and architects. These lighting design software of
prior art that function as calculation programs use photometric data derived from a
multiplicity of light fixtures tested in laboratory conditions based upon any kind of light

source (commonly referred to as candle power data). This photometric data is input to
the program as a source for the calculations performed thereby. The lighting designer or
architect uses the software and enters information to construct a model room based on
predetermined parameters for the given project, which may vary by project; the
predetermined parameters generally include reflectance, room dimensions, furniture, partitions, and other objects are also entered if relevant. The lighting designer or architect then inserts the desired or predetermined light fixtures and the software performs its calculation of illuminance in the room, often based at or approximately desk height (about 30” off floor). Generally, the prior art software will give about ten percent (10%) variance between estimated and actual illuminance because other factors or parameters existing in a real world situation may be slightly different. The use of calculation software is fairly straightforward, with some functions similar to CAD software programs also used by architects. Most notably, the basis of most of the software calculations is the standard, traditional light bulb. Thus, none of the prior art software provide estimations of non-traditional lighting sources or means, for example fiber optic lighting. The variables common in a fiber optic lighting system are different than traditional lighting and include, inter alia, the lengths of fibers, bends, kinks, fixtures. Given the number of additional variables for fiber optic lighting systems, testing every combination not practical or reasonable. As such, mere addition of selections for fiber optic lighting in traditional lighting based software would be both inaccurate and ineffective. Thus, no prior art lighting design software could readily accommodate non-traditional lighting options, including fiber optic lighting systems.

Furthermore, the cost of the prior art software is expensive, ranging between about $600-700. Software updates are required regularly, approximately every year or two and generally cost about $150-200 for each update. Not all software includes options for all room designs, so that approximations and estimations not including all factors are the best that can presently be offered among commercially available lighting design
software products. Also, all calculation programs require an engine to make them run; these engines are composed of a series of algorithms, the specific equations and combinations thereof can vary between programs, wherein some programs are more accurate than others. Some variation has been noted in some cases to be linked to software provided by companies that also supply the lighting in order to cast a more favorable light on their particular products, thereby hoping to entice or induce users of the software to select those same products over competitive ones. Additionally, such variation often makes software developed by or supplied by lighting manufacturers or suppliers less credible and reliable. Thus, there remains a need for a reliable and cost-effective means for lighting designers and architects to access calculation engines that accommodate all lighting types, both traditional and non-traditional, that accommodate broader room designs (including skylights, sloped ceilings, different room configurations, etc.) to provide more accurate illuminance values and products to realize them in actual installation and use.

There are other problems and concerns associated with providing a remote access lighting design software system, specifically relating to loss of data control and security, difficulty or unacceptably slow downloading of information and data, and lack of training or access to assistance in using the software from a remote location. Thus, there remains a need in the lighting design industry for a secure, reasonably quick remote access to lighting design software that includes broad and up-to-date specification options for both traditional and non-traditional lighting.

By way of summary, the prior art relating to lighting design software commonly employs software to assist with design layout for traditional lighting. However, the
software is expensive thereby precluding use by most small design or architectural firms. Furthermore, any software that has existed for serving the lighting design industry is only capable of dealing with traditional lighting specifications. Thus, no lighting design software exists for lighting design using non-traditional lighting, including fiber optic lighting.

Furthermore, lighting design software applications are not presently available for application on mainframe computers for use at remote terminals by more than one user. Furthermore, applications change frequently, making the ownership and updating of software not an economically viable option for many small architectural firms or independent lighting designers, many of whom are small entities, comprising one or two designers in the business. However, the lighting designers and occasionally architects are primarily responsible for the specification and selection of lighting design and lighting systems for new or renovated construction projects. Thus, the lighting designers and architects who specify lighting products and systems in architectural plans have substantial influence in the buying process of lighting fixtures, connections, and sources. Therefore, the lighting designers and architects who specify lighting products and systems need access to the most updated version of any lighting design software applications.

The bottleneck for the sale of lighting products rests with the customer’s ability to translate traditional lighting designs into fiber optic designs. Before a customer buys a lighting system of any kind, there is a plan. This plan may contain the number of points of light, the energy necessary to power the system, the location of the lights and many other specifications. The present invention is constructed to assist in the design of most
of the lighting projects for both traditional and non-traditional lighting, including fiber optic lighting.

Lighting designers like all designers prefer to design unique but functional systems to gain notoriety. In the past three years, over 1100 lighting designers and architects have taken a fiber optics seminars sponsored by the company. The average lighting designer or architects specifies $2mm of products per year. If one project with the average value being $50,000 is specified by %10 of the designer then this represents $5.5 mm in sales. As the higher light output for light sources for non-traditional lighting becomes available, it is expected that 25% of this group of designers, architects, and specifiers to design five to six fiber optic projects in year two and three. Thus 275 designers specifying $250,000 of lighting projects has a value of $68mm. The present invention will enable thousands of architects and even consumers to use either traditional or non-traditional lighting and combinations thereof.

Additionally, another function of the designer includes finding sample information from catalogues, the vendor or the website of these vendors to put the appropriate information in the plans. This is a very time consuming job. Likewise when the builder is preparing a bid based upon the design plans, s/he must look up the detail information about the product to estimate cost of materials as well as understand cost for installation. This is a very time consuming process that no prior art addresses or teaches toward in any manner. Hence there remains a need for consolidation of design specifications and related information supporting the products selected to match the design requirements and specifications.
Thus, there remains a need for a remote lighting design system having an application server provider computer and terminals in connection therewith for accessing the most updated software for specifying and selecting lighting design and lighting systems for new or renovated construction projects.

Furthermore, there remains a need for a business model and electronic commerce system for ordering lighting and other products directly from architectural, design, and engineering plans available on-line or via electronic data transfer medium.

Summary of the Invention

The present invention is directed to a remote lighting design system for selection and specification of lighting fixtures, connections, and sources, including conventional and fiber optic lighting options. Additionally, the present invention is further directed to an electronic commerce (e-commerce) model and method for doing business that enables remote user(s) to have access to architectural, design, and engineering plans available on-line or via electronic data transfer medium and to directly view specifications and detailed product and/or service information, to order and/or to purchase products and/or services via selecting active icons or live links associated with or otherwise embedded in or connected with those plans.

In the preferred embodiment, a remote lighting design system for selection and specification of lighting fixtures, connections, and sources, including conventional and fiber optic lighting options, includes an applications server provider (ASP) having lighting design software applications installed thereon, connected to remote terminals for use by lighting designers and architects.
Preferably, the remote lighting design system includes an ASP having lighting design software applications installed thereon to which users of remote terminals have access via Internet or other electronic data transfer connection. Also preferably, the remote lighting design system includes an ASP having software installed thereon for providing access to data management applications, including accounting, communications, word processing, and the like, to which users of remote terminals have access via Internet connection. Also preferably, the remote lighting design system has an ASP includes software installed thereon for providing interactive ordering and electronic commerce activity to which users of remote terminals have access via Internet connection, for placing orders on-line for lighting fixtures, connections, and sources.

The present invention is further directed to a method for designing lighting systems using software installed on an applications server provider (ASP) accessed via remote terminal(s), preferably via Internet connections, wherein the lighting designer user accesses the Internet via an Internet Service Provider (ISP) for connecting to a website providing a login for user identification (user ID) and passcode, whereby after the user login is successful, the user can access the remote light design software application, the user enters data including light amount required for a given area, the software automatically calculates the lumens required and suggests lighting specifications for light fixtures, connections, and sources, preferably both for traditional and fiber optic lighting.

Thus, the present invention provides a remote lighting design system having an application server provider computer and terminals in connection therewith for accessing the most updated software for specifying and selecting lighting design and lighting systems for new or renovated construction projects. Furthermore, the present invention
also provides an e-commerce business model and method for doing business that enables remote user(s) to have access to architectural, design, and engineering plans available on-line or via electronic data transfer medium and to directly view specifications and detailed product and/or service information, to order and/or to purchase products and/or services via selecting active icons or live links associated with or otherwise embedded in or connected with those plans.

Accordingly, one aspect of the present invention is to provide a lighting design system for selecting lighting including an application server provider (ASP) having a server computer and at least one computer terminal in electronic connection therewith and general lighting software installed on at least the server computer for permitting a user to access the general lighting software from the at least one remote computer terminal to select lighting options. Additionally, non-traditional lighting software, including fiber optic lighting design software, is installed on the ASP according to the present invention.

Another aspect of the present invention is to provide a lighting design system for selecting lighting including fiber optic lighting software installed on a computer for permitting a user to select lighting options wherein the user inputs data, the data including the amount of light needed for a preselected application, further including a conversion program for converting the amount of light needed into lumens for selecting fiber optic light components that provide the amount of light needed.

Still another aspect of the present invention is to provide an automated product specification system allowing a user to design, select, and/or purchase lighting products and systems via remote electronic communications interface, the system including
interface means, input means for receiving an input from the user, the input identifying lighting products based upon predetermined design criteria, the criteria including an amount of light, means for demonstrating to the user the amount of light for a space, the space determined by specifications provided by the user as input via the remote electronic communications interface, means for identifying light products and systems to produce the amount of light, means for obtaining, storing, and retrieving a user profile for the user, means for storing and retrieving transaction data, the data comprising user profile and light products and systems to produce the amount of light, and means for converting the input identifying light products from traditional lighting to fiber optic lighting and vice versa.

Still another aspect of the present invention is to provide an automated product specification system allowing a user to design, select, and/or purchase lighting products and systems via remote electronic communications interface further including live links in design and architectural plans and specifications wherein the live links include an icon, name, label, or other symbol that directly links to product specifications and order information from a database, a website on the Internet, and/or similar electronic data storage means when the user selects the live link(s) or active icon(s). The e-commerce method of doing business via live links connected with the architectural, design, and/or engineering plans and the products and/or services specified therein provides a means for revenue generation by the system host or manager by requiring that users who access the plans and companies, manufacturers, distributors, and suppliers having icons for the live links are charged a fee for access and listing in the system, respectively. Thus, the system host or manager can make money on the electronic plans when users access the
plans, either for read-only or for modifications thereto, as well as for distribution of the plans electronically or on data storage means, including but not limited to computer disk, CD, or other digital or electronic data storage device. Significantly, the e-commerce business model using live links or active icons eliminates or substantially reduces the need for generation, management, storage, and shipment of hard copies of the architectural, design, and/or engineering plans.

Finally, another aspect of the present invention is to provide methods for using the systems set forth in the foregoing aspects of the invention, comprising the following steps: providing an application server provider including at least one computer host in connection with data transmission lines, the at least one computer host including a database and software for accessing the database and reading, writing, and storing data therein, and capable of being accessed via Internet connection and through a website; providing at least one remote computer in connection with data transmission lines, the at least one remote computer capable of accessing the Internet; a user accessing the application service provider via Internet connection; the user entering a user identifier and a user passcode for creating a file; the user entering predetermined data for lighting design specifications and requirements; and the user selecting lighting design options presented on the application server provider based upon the predetermined data entered by the user and the application service provider database and software, wherein the database and software of the application service provider comprise lighting design software for use in designing and specifying lighting. One embodiment of the present invention is directed to the system incorporating the use of product and company icons embedded in the drawings or specifications that are live links to the required product

10
information and method of using the same. Instead of typing this information in the plans these icon can be dragged and dropped into the plan. This eliminates 20% or more of the work for both the designer and/or architect and the user of the plans. It also makes putting a bid together easier since the information is an icon away for the builder referencing the plans. Thus, the designer to design more projects and the builder to bid on more jobs in the amount of time formerly required for a single project and bid, respectively. Furthermore, the use of live links in the plans creates the possibility for generating revenue for access to the plans, for listing and hosting the live links to specific suppliers, and for electronically transferring the plans, while substantially reducing the cost to all users of the plan by eliminating the hard copy plan development, maintenance, management, storage, and shipment as well as saving the time associated with the same.

These and other aspects of the present invention will become apparent to those skilled in the art after a reading of the following description of the preferred embodiment when considered with the drawings.

**Brief Description of the Drawings**

Figure 1 is a front view of a computer screen having an initial window design according to the present invention.

Figure 2 is a front view of an alternative embodiment of the present invention, showing a starting design window.

Figure 3 is a front view of an alternative embodiment of the present invention, showing a non-traditional lighting system design layout window.

Figure 4 is a front view of an alternative embodiment of the present invention, showing an end fixture gallery window.
Figure 5 is a front view of an alternative embodiment of the present invention, showing an end fixture photometric report of type interior window.

Figure 6 is a front view of an alternative embodiment of the present invention, showing an end fixture property window.

Figure 7 is a front view of an alternative embodiment of the present invention, showing view pull-down menus.

Figure 8 is a front view of an alternative embodiment of the present invention, showing relational categorization of data by classification.

Figure 9 is a diagram showing applications of an embodiment of the present invention from a user perspective.

Figure 10 is a diagram showing application flows for operation of an embodiment of the present invention.

Figure 11 is a diagram of lighting system classification according to an embodiment of the present invention.

Figure 12 is a diagram showing persistent data storage according to an embodiment of the present invention.

Figure 13 is a diagram showing photometric data classification according to an embodiment of the present invention.

Figure 14 is a diagram showing additional classification of data according to an embodiment of the present invention.

Figure 15 is a diagram showing live links according to a preferred embodiment of the present invention.
Figure 16 is a diagram showing live links according to another preferred embodiment of the present invention.

**Detailed Description of the Preferred Embodiments**

In the following description, like reference characters designate like or corresponding parts throughout the several views. Also in the following description, it is to be understood that such terms as "forward," "rearward," "front," "back," "right," "left," "upwardly," "downwardly," and the like are words of convenience and are not to be construed as limiting terms.

Referring now to the drawings in general, the illustrations are for the purpose of describing a preferred embodiment of the invention and are not intended to limit the invention thereto. As best seen in Figure 1, a computer screen is shown having an initial window design for the lighting design system according to the present invention. Preferably, the present invention includes an application server provider (ASP) having at least one server or data storage means in data transmitting capable-connection thereto.

Preferably, the ASP further includes a general lighting software installed on at least the at least one server computer thereby permitting the remote user to access the general lighting software from a remote location from the ASP for selecting traditional lighting options for the design project. More preferably, the ASP further includes non-traditional lighting software, including fiber optic lighting design software, installed on at least the at least one server computer thereby permitting the remote user to access the general lighting software from a remote location from the ASP for selecting non-traditional lighting options for the design project.
In the preferred embodiment configure according to the present invention, the application server provider is accessible by at least one remote user, preferably a multiplicity of discreet remote users simultaneously or concurrently, having a remote computer including a remote screen or terminal in data transmitting capable connection with the ASP. When the at least one remote user accesses the ASP via its connection, preferably using a modem or high speed data line such as a T1 line to access an ASP website available on the Internet. In a preferred embodiment, the initial window presented and viewable on a computer screen of a remote computer or Internet access device, or a remote screen includes options for the remote user to consider and select based upon whether the remote user will be starting a design project from scratch or opening an existing file stored in the ASP storage means, using an automated assistant for the design project, and entering company information. The remote user selects the appropriate option based upon predetermined information available for the design project and based upon the expertise of the remote user with the system. The system accommodates at least one remote user, preferably a multiplicity of remote users simultaneously and/or concurrently, the multiplicity of remote users accessing the ASP from a multiplicity of different ASP access means, for example different computer terminals.

Following the initial window, the remote user is engaged by a series of connected windows, each window being presented by the ASP for viewing by the remote user at a remote location and connected by user options represented on the remote screen or viewing device as "buttons" whereby selecting the button via a computer mouse or other point and click or selection means permits the remote user to advance or return to a
different window or screen configuration. The collective group of the series of connected windows provides the remote user with an automated product specification system for designing, selecting, reviewing, and/or purchasing lighting products and systems, either traditional or non-traditional or a combination thereof, via remote electronic communication interface. The input means for receiving an input from the remote user includes tool bars, icons, symbols, and/or data entry prompts whereby the remote user selects the desired item via the computer mouse or other selection means to identify the lighting products and specifications based upon predetermined design criteria including, *inter alia*, the amount of light expressed in units of lumens or Watts or by viewing an amount of light demonstrated by a model shown on the remote screen equivalent to a range of amounts of light within a predetermined scaled continuum. In the latter case, means for demonstrating the amount of light for a given space occurs via the model shown on the remote screen. The model is constructed according to input entered by the remote user, that input including room dimensions, objects in the room, location of light sources and filters, and the like. The input entered by the remote user is capable of being stored, maintained and retrieved from the ASP server when the remote user or authorized representative thereof successfully enters a predetermined user identification and passcode recognized by the system. In a preferred embodiment, different levels of access to stored data files for a given design project are permitted based upon different passcodes and user identification combinations.

Where the input from the remote user specifies either traditional lighting only or non-traditional lighting only, the system is capable of converting between traditional and non-traditional lighting systems via input conversion means including algorithms,
calculations, and tables. Figure 5 shows an alternative embodiment of the present invention, having an end fixture photometric report of type interior window. The conversion means uses data from the photometric report to convert between traditional and non-traditional lighting. Additionally, the persistent data shown in Figure 12 are used in the conversion between traditional and non-traditional lighting where all information is not specified by the remote user. The persistent data preferably includes photometric data from light testing in laboratories, conversion algorithms and other calculations and formulas, software code and necessary strings, references, and directors related thereto, and manufacturing data for at least one manufacturer of lighting products.

In a preferred embodiment, the system includes means for accepting an order from the remote user wherein the remote user has previously created a file including a design project having a unique identification or label. The previously created file is stored at least temporarily on the ASP. Order accepting means includes identification of the design project, referencing selected lighting products and systems specified therein including the product number or identifier, a manufacturer or supplier thereof, price, shipping and handling fees, data for shipment and delivery entered as input by the remote user, and payment means, including entry of information for using credit or debit cards or other automated payment. More preferably, the previously created file is structured as design, architectural, or engineering plans or specifications wherein the products specified in the plans include live links to information about the products, including detailed specifications, manufacturer or supplier, price, and ordering information. By selecting the live links, the remote user can directly order the products and/or services specified in the plans for that design project file stored on the ASP.
Referring now to Figure 2, an alternative embodiment of the present invention showing a starting design window is presented. Preferably, when a remote user of the ASP system begins a new design project, the starting design window is presented on a remote screen. In a preferred embodiment, the starting design window includes options for the remote user to select via buttons on the screen or display, including whether to use an automatic design assistant, using a design template, starting from scratch, opening an existing design file, or instructions or help functions. Selecting any of these options transfers the remote user to another screen based upon the selection.

Referring now to Figure 3, an alternative embodiment of the present invention including a non-traditional lighting system design layout window is shown. Preferably, the non-traditional lighting system is a fiber optic lighting system, including components or combinations of the following: a light source having an energy supply, fiber lines for light-transmitting connection therewith, and at least one lighting fixture.

Figure 4 shows an alternative embodiment of the present invention including an end fixture gallery window presented to the remote user on a remote computer screen or display. The end fixture gallery provides fixture options for the remote user to select based upon predetermined design requirements for a specific design project. The end fixtures are provided for selection by the remote user via selection means set forth in the foregoing for other windows. Similarly, Figure 6 shows an end fixture property window viewable on a remote computer screen or display. The end fixture properties are provided for selection by the remote user via selection means set forth in the foregoing for other windows.
Referring now to Figure 7, view pull-down menus are shown according to a preferred embodiment of the present invention. In a preferred embodiment, the view pull-down menus for use by the remote user for accessing different windows within the system include at least properties, photometric report, format type (traditional or non-traditional lighting), and components based upon format type. Figure 7 shows options for a non-traditional, fiber optic lighting format type. Also, Figure 8 shows relational categorization of data by classification for a non-traditional lighting option. In a preferred embodiment of the lighting design system according to the present invention, classification of data includes observable data, persistent data, lighting component data, end fixture data, light source data, optical fiber data, installation data, project data, supplier data, and plan data, including bill of materials (BOM). While the remote user does not view the data from the diagram shown in Figure 8, that data is presented to the remote user via the various windows set forth in the foregoing according to logical connection between and among windows having relevant relationships as illustrated in the diagram of Figure 8. A similar relational diagram may be constructed for traditional lighting following the same outline presented in Figure 8, with substitutions for traditional lighting components instead of the fiber optic components. Additional classifications of data used in the system are set forth in the diagram shown in Figure 11. Figure 9 is a diagram showing applications of an embodiment of the present invention from a remote user perspective. Preferably, the remote user has a variety of options for using the lighting design system according to the present invention. By way of example, the remote user has at least the options of starting a new design project,
opening an existing file previously constructed by the remote user, modifying the existing file if an acceptable user identification and passcode combination is entered successfully.

Figures 10A-10H are diagram showing application flows for specific operations of a preferred embodiment of the present invention. Figure 10A shows stop/start of the lighting design software and stop launched applications flows. Figure 10B shows flows or steps in the software for configuring the software itself. Figure 10C illustrates a flow diagram for display of selecting end fixtures from a remote source lighting system (RSLs) layout window. Figure 10D illustrates a flow diagram for a remote source lighting system (RSLs) port configuration and attach end fixture functions. Figure 10E shows a flow diagram for calculation of light output. Figure 10F shows a flow diagram for modification of optical fiber selections by the remote user. Figure 10G shows a flow diagram configured according to a preferred embodiment of the present invention for selection of a different illuminator product or light source for non-traditional lighting design. Figure 10H illustrates a flow diagram showing the process flows for viewing lighting components photometric report by the remote user of the system. While the foregoing flow diagrams are presented to illustrate the operational flows of the system constructed according to a preferred embodiment of the present invention, they do not represent exclusively or entirely all of the process flows of the system but illustrate key options and windows and flows connected therewith for the system. Additional and alternative windows and options and associated flows are readily established consistent with the flows set forth in the foregoing but are not presented herewith for the sake of conciseness. However, one having ordinary skill in the art will understand that additional
and alternative flows function in similar ways without having to view the flow diagrams for them.

As shown in Figure 12, persistent data storage exists within the system according to an embodiment of the present invention. Preferably, any data entered by a remote user may be stored for a predetermined period of time, based upon the remote user’s needs and preferences. However, persistent data is stored permanently within the ASP and servers or other data storage devices in data transmission-capable connection therewith. The persistent data preferably includes photometric data from light testing in laboratories, conversion algorithms and other calculations and formulas, software code and necessary strings, references, and directors related thereto, and manufacturing data for at least one manufacturer of lighting products. In an alternative embodiment, a multiplicity of manufacturers’ data for a variety of lighting products, including traditional and non-traditional lighting are included in the persistent data.

As best seen in Figure 13, photometric data classification according to an embodiment of the present invention is shown. In a preferred embodiment, the photometric data classification include flood, interior, roadway, and theater lighting. Additionally, area geometry, photometric report types and format types, fiber optic subsystem and remote user files are included in the photometric data classification for a preferred embodiment according to the present invention.

Referring now to Figure 14, additional classification of data according to an embodiment of the present invention is shown. In a preferred embodiment, miscellaneous classes including optical fiber type, illuminator color type, lamp type, lighting application type, end fixture distribution type, subsystem data, installation
instructions, and product specifications are included within the ASP system and accessible by a remote user of the present invention.

Figures 15 and 16 show live links according to preferred embodiments of the present invention. More particularly, Figure 15 shows a screen view on a computer for creating a live links document that allows the attachment of an architectural, engineering, and/or lighting design document. Using an approach similar to email, the live links document may include the URL’s of the lighting products and any other products specified as well as any other useful information in HTML, text, or other suitable format. Attachments to the file may be of any format and will be passed to the recipient “as is.”

Figure 15 shows a preferred embodiment of the present inventions with attachments that may be directly accessed by the user via point-and-click or other opening means. Alternatively, and also preferably, the present invention is directed to live links and related document(s) and/or file(s) that are attached to the architectural, engineering, and/or lighting design document. This embodiment requires that the architectural document file format permit the attachment of such a file. The attached file contains each of the live links and information that specifies where on the drawing(s) the product is appropriately placed, positioned, and/or affixed. In a preferred embodiment, the placement information enables the product or service live link icons to be overlaid on top of the drawing for display and printing.

In another preferred embodiment, the live link icons are inserted directly into the architectural drawing, as best shown in Figure 16. The file formats of the architectural, engineering, and/or lighting design drawing software system and the drawing support the live links and related features. A stencil of icons are provided through the ASP service,
for example, which represents lighting products. The icons are capable of being dropped onto the drawing and the attributes set by the specifier, architect, engineer, and/or lighting designer. Figure 16 shows a simplified representation of an architectural drawing with live links or active icons placed on the drawing, as shown on a computer screen. A summary icon is also used to provide a product and/or service list and schedule of all live links contained in the drawing(s).

Furthermore, in a preferred embodiment of the present invention the system is constructed with a remote user interface that functions in approximately real time and having an ASP database that stores information and data generated by the remote user when using the system to design lighting system(s). Generally, the remote user accesses the ASP via a remote computer or Internet access device having a display. Then the remote user performs a login to a website for the ASP and lighting design system according to the present invention. The remote user login preferably includes a user identification and a passcode in unique combination that is predetermined by the system for the remote user. Preferably, a multiplicity of remote users having different user identification and passcode combinations may access the system at the same time, including previously created and stored files for which the respective user identification and passcode combinations have authorized access. Following successful login, the remote user accesses the lighting design software including all relevant conversion and calculation programs as well as general office software. In a preferred embodiment the remote user is required to pay a monthly fee for access to the system; lack of payment may deactivate the user identification and passcode temporarily until payment is made. Preferably the system including the ASP has the capacity to store information and data
form previously constructed files. The remote user must enter a successful login to retrieve drawings, plans, design files, other data files, etc. Additionally in a preferred embodiment, live links are established in the plans and files including design and CAD drawings. The live links enable the remote user to access detailed product information and specifications, ordering, price, manufacturer and supplier information, etc.

A preferred embodiment of the present invention also includes software specifically developed for fiber optic lighting design. Because the variables in fiber optic lighting systems are substantially different than for traditional lighting, no previously existing lighting design software has been able to deal with fiber optic or other non-traditional lighting design. The variables in fiber optic lighting systems include, *inter alia*, lengths of fibers, the number and degree of fiber bends and kinks, the type of end fixtures for producing different lighting effects within a space or room, light source type and power, lens type and quantity, filters, and shutters. Additionally, calculations are included in the software that consider loss factors, including consideration of an amount of light lost in the fibers, including color shifts in the fiber and losses at fiber connections.

Overall, the data most valuable to the remote user for lighting design is the value of output at a fixture, or what amount of light is presented and projected into the space or room. Other data necessary to determine the amount of light include the variables set forth above. While testing every combination of end fixtures, light sources, and fibers having an infinite number of configurations and bends is not practical or reasonable, a significant number of end fixtures data based upon lab testing is available and provided with the lighting design system of the present invention. In a preferred embodiment, the lighting design system integrates the non-traditional, including fiber optic, lighting and
traditional lighting design software wherein a conversion algorithm translates between the systems via the common term of amount of light available as output.

Additionally, the preferred embodiment employs security means for preventing unauthorized access to remote user files. Security means include encryption, firewall construction, and secured servers. Also, back-up assurances and regular off-site data storage are employed to prevent complete data loss in the event of a computer crash or other system breach. Also preferably, the system has the capability of downloading, high speed downloading and high-speed backup for remote users to obtain and save their data at the remote location off-line.

Preferably, the system is available for remote user access continuously, night and day. More preferably, an automatic online help is also available to the remote user anytime, especially for new users. Additionally, a live-person help online or via telephone or pager is also provided with the system. Also preferably, the system is accessible by remote users of different languages, with preselected language options presented on an initial screen window for the remote users to select which translation is preferred. Also, the system is designed to be user-friendly or easy to use, presenting options for selection by the remote user of different degrees of difficulty: automatic assistance with design or non-assisted expert mode. Finally, the system software is automatically updated regularly as necessary including the steps of loading or updating new software, testing for bugs and eliminating them.

Nowhere in the prior art exists the combination of the fiber optic software, traditional lighting software, application services provider and embedded links in design plans as a business model. Particularly, the universal scope of the e-commerce business
model and method of doing business wherein an automated product specification system allowing a user to design, select, and/or purchase lighting products and systems via remote electronic communications interface further including live links in design and architectural plans and specifications wherein the live links include an icon, name, label, or other symbol that directly links to product specifications and order information from a database, a website on the Internet, and/or similar electronic data storage means when the user selects the live link(s) or active icon(s) has never before been developed or even anticipated. The e-commerce method of doing business via live links connected with the architectural, design, and/or engineering plans and the products and/or services specified therein provides a means for revenue generation by the system host or manager by requiring that users who access the plans and companies, manufacturers, distributors, and suppliers having icons for the live links are charged a fee for access and listing in the system, respectively. Thus, the system host or manager can make money on the electronic plans when users access the plans, either for read-only or for modifications thereto, as well as for distribution of the plans electronically or on data storage means, including but not limited to computer disk, CD, or other digital or electronic data storage device. Significantly, the e-commerce business model using live links or active icons eliminates or substantially reduces the need for generation, management, storage, and shipment of hard copies of the architectural, design, and/or engineering plans.

In a preferred embodiment of the present invention, application software for the conversion of traditional lighting designs into fiber optic designs. Also in a preferred embodiment, business support software, including word processing, spreadsheet, forms
and template generating, accounting and other business-related software are packaged within the ASP for use by the remote user of the system.

Preferably, the present invention includes design software for traditional lighting and non-traditional fiber optic lighting presented to the remote user via windows, sub-windows, pull-down menus, tool bars, and/or pop-ups on the screen of a computer. The window will include a conversion between non-traditional lighting and traditional lighting, preferably showing the equivalent of the traditional lighting design in fiber optic lighting options. The windows or pop-ups are periodically and regularly updated in order to keep the advantages and developments of the non-traditional technology reliably available directly to the remote user, generally a lighting designer or an architect.

Additionally, other pop-ups or sub-windows are used in a preferred embodiment of the present invention to advise the architect, designer, or other user of the advantages of fiber optic lighting systems over traditional lighting. Similarly, suppliers who purchase active icons or live links that appear in the electronic plans can purchase advertising in pop-ups that appear at predetermined points and positions in the software and display windows.

Advantageously, the present invention includes both the traditional and non-traditional lighting design options, including the fiber optic design, with little or no work for the designer in calculating and converting to establish equivalents between the traditional and non-traditional systems, thereby providing them the ability to show their clients at least two designs based in different lighting sources and systems.

Preferably, the system according to the present invention includes the assessment of a fee on the user to deliver the plans designed and stored on the ASP and related computer servers connected in data transmission capability thereto. Thus, a copy of the
design drawings must be made available to the user, provided that the user supplies and inputs a predetermined user identification, including a confidential passcode. A preferred embodiment according to the present invention provides the remote user with two options for delivery of the plans: 1) the user simply provides via input to the system with the delivery address for delivery of a CD Rom or other mobile storage device or means; and/or 2) a temporary passcode is provided for each recipient of the plans to use on the ASP site.

Once the remote user has approved the drawings then the bid process starts, ideally involving a multiplicity of bids. The remote user of the system according to the preferred embodiment sends out notification, preferably via electronic notification such as e-mail in notice of bid opportunity to a multiplicity of builders. In a preferred embodiment, the ASP host will charge the bidder or remote user a fee for access the plans; preferably, the access is limited to view-only or read-only so that unauthorized modification of the plans is not permitted. In an alternative embodiment, the remote user is permitted modification access for a fee assessed by the system host or manager. In a preferred embodiment, the bidder’s limited access to the plans is controlled via the temporary passcode issued by the ASP host or other authorized controller of the system. Additionally, the ASP host will establish and maintain a list of possible bidders for projects whereby the remote user designer, architect, and/or plan owner may send out the request for bids via the ASP database of likely bidders. The business model according to the present invention is substantially more efficient than traditional business models involving modification to hard copies of the plans, including management, storage, and transport or delivery costs and delays associated therewith.
In a preferred embodiment of the present invention, the remote users of the ASP, including designers and architects, will be able to access all of the software they need to run their business from the application server provider via remote access through modem or high speed connection either directly or via a website located the Internet, preferably via successful entry of a predetermined user identification and passcode. Additionally, a multiplicity of discreet remote users will be able store their drawings as well as make them readily accessible to anyone having a valid passcode and user identification. In a preferred embodiment, the user identification and associated passcode is temporarily provided to a multiplicity of bidders to permit read-only access, including activation of live links embedded in the plans.

In a preferred embodiment of the present invention, the design, architectural and engineering plan or specifications contains not only the layout but performance details about the products in those plans. In additional, several examples of the products and/or vendors are listed to facilitate the owner's ability to find the right product. Most of the time, a builder or electrical contractor will bid on the project based on these suggested vendors and products.

One embodiment of the present invention is directed to the system incorporating the use of product and company icons embedded in the drawings or specifications that are live links to the required product information and method of using the same. Instead of typing this information in the plans these icon can be dragged and dropped into the plan. This eliminates 20% or more of the work for both the designer and/or architect and the user of the plans. It also makes putting a bid together easier since the information is an icon away for the builder referencing the plans. Thus, the designer to design more
projects and the builder to bid on more jobs in the amount of time formerly required for a single project and bid, respectively.

Presently, E-commerce models generate revenue every time someone uses the company's site as a portal of entry to their site. Preferably, a business model constructed according to one embodiment of the present invention will generate revenue each time an icon is placed on plans. Given that there are more than a million plans generated each year and that each of these plans contain hundreds and even thousands of products and companies listed in the specifications, the introduction of live links into design and/or architectural plans greatly improves efficiency for consumers and users of those plans as well as providing a revenue-generating opportunity for the host of the application server provider wherein the plans are generated, stored, used and retrieved. Equally as important is that the use of this embodiment of the present invention by designers and/or architects as well as consumers and users of the individual and comprehensive plans will substantially facilitate and simplify the work of all users of the plans, including the buying transaction, as well as focusing and directing all users to the ASP host site.

According to one embodiment of the present invention, the introduction of live links into design, architectural, or other drawings, specifications, and/or plans provides a delivery system for drawings and plans whereby the live links permit lighting manufacturers, suppliers, and vendors to place active icons in the drawings having direct and immediate access to detailed specifications and diagrams, as well as on-line ordering.

Finally, the present invention presents a business model, including systems and methods thereof for the combination of the fiber optic software, traditional lighting
software, application services provider and embedded links in design plans as a business model; such a model is neither exists nor is suggested or taught in the prior art.

Certain modifications and improvements will occur to those skilled in the art upon a reading of the foregoing description. By way of example, the live link object(s) may exist in separate documents with reference to XML method; a call or method invokes the procedure that performs the respective function for each of the live links in the architectural, engineering, and/or lighting design document and/or software.

Alternatively, and also preferably for the present invention, the ASP provides an object database that contains the functions and/or software associated with the live links.

Additionally, the ASP functions as a repository of the basic live links structure. Also alternatively and preferably, a manufacturing database is established, constructed, and configured to interface with the ASP for providing the information of goods and/or services associated with respective live links.

All modifications and improvements have been deleted herein for the sake of conciseness and readability but are properly within the scope of the following claims.
CLAIMS

1. A lighting design system for selecting lighting comprising
   an application server provider (ASP) having a server computer and at least one
   remote computer in electronic data transmission connection therewith and
   general lighting software installed on at least the server computer for permitting at
   least one remote user to access the general lighting software from the at least one remote
   computer to select lighting options, the at least one remote computer having a display
   device for displaying a series of interconnected windows presented by the software.

2. The lighting design system according to claim 1, further including fiber optic
   lighting software installed on at least the server computer for permitting the remote user
   to access the general lighting software from the at least one remote computer to select
   non-traditional lighting options.

3. The lighting design system according to claim 1, further including live links
   embedded in the software and displayed on at least one remote screen for at least one
   remote user of the system, whereby selection of the live links by the remote user connects
   the remote user to a window presented on the remote screen displaying detailed product
   specifications and information provided by a manufacturer of products represented by the
   live links.

4. The lighting design system according to claim 1, wherein the at least one remote
   user accesses the server via electronic data transmission connection with a modem.
5. The lighting design system according to claim 1, wherein the electronic data transmission connection is an Internet connection.

6. The lighting design system according to claim 5, wherein the general lighting software is accessible by the at least one remote user via a website and the application server provider.

7. The lighting design system according to claim 1, wherein the at least one remote user accesses the system after successfully entering a unique user identification and passcode.

8. The lighting design system according to claim 1, further including a file and data storage system existing on the application server provider for saving, receiving, storing, maintaining, modifying, and retrieving project data for at least one remote user.

9. The lighting design system according to claim 1, further including business support software installed and functioning on the application server provider and accessible by the at least one remote user.

10. The lighting design system according to claim 1, further including ordering software installed and functioning on the application server provider and accessible by the at least one remote user for ordering lighting products and related services.

11. The lighting design system according to claim 9, wherein the business support software includes communications, accounting, data management, and word processing functions.

12. The lighting design system according to claim 2, further including visual selections and views presented to the at least one remote user via a window displayed on the at least one remote computer, the visual selections and views presenting
representations of fiber optic products for selection by the at least one remote user when
the at least one remote user selects an icon representing at least one of the fiber optic
products.
13. The lighting design system according to claim 12, wherein a multiplicity of
different icons are presented in a toolbar on the at least one remote computer.
14. The lighting design system according to claim 2 wherein the fiber optic lighting
software includes algorithms and calculations for automatic conversion of units of an
amount of light from Watts to lumens and vice versa.
15. The lighting design system according to claim 14, wherein the calculations
include loss factors for considering any and all losses in the fiber optic system.
16. The lighting design system according to claim 15, wherein the loss factors include
an amount of light lost in the fibers, including color shifts in the fiber and losses at fiber
connections.
17. A lighting design system for selecting lighting comprising
an application server provider (ASP) having a server computer and at least one
remote computer in electronic data transmission connection therewith;

general lighting software, fiber optic lighting software, and business support
software installed on at least the server computer for permitting at least one remote user
to access the software from the at least one remote computer to select traditional and non-
traditional lighting options, the at least one remote computer having a display device for
displaying a series of interconnected windows presented by the software; wherein the
fiber optic lighting software includes algorithms and calculations for automatic
conversion of units of an amount of light from Watts to lumens and vice versa thereby

33
enabling the at least one remote user to consider lighting designs in traditional and non-
traditional lighting without performing manual calculations; wherein the electronic data
transmission connection is an Internet connection and the software is accessible by the at
least one remote user via a website and the application server provider after the at least
one remote user accesses the system by successfully entering a unique user identification
and passcode;

live links embedded in the software and displayed on at least one remote screen
for at least one remote user of the system, whereby selection of the live links by the
remote user connects the remote user to a window presented on the remote screen
displaying detailed product specifications and information provided by a manufacturer of
products represented by the live links; and

a file and data storage system exists on the application server provider for saving,
receiving, storing, maintaining, modifying, and retrieving project data for at least one
remote user such that the at least one user can order products from product data via the
live links.

18. A lighting design system for selecting lighting comprising

fiber optic lighting software installed on a computer for permitting a user to select
lighting options wherein the user inputs data, the data including the amount of light
needed for a preselected application, further including a conversion program for
converting the amount of light needed into lumens for selecting fiber optic light
components that provide the amount of light needed.
19. An automated product specification system allowing a user to design, select, and/or purchase lighting products and systems via remote electronic communications interface, the system comprising

interface means,

input means for receiving an input from the user, the input identifying lighting products based upon predetermined design criteria, the criteria including an amount of light,

means for demonstrating to the user the amount of light for a space, the space determined by specifications provided by the user as input via the remote electronic communications interface,

means for identifying light products and systems to produce the amount of light,

means for obtaining, storing, and retrieving a user profile for the user, and

means for storing and retrieving transaction data, the data comprising user profile and light products and systems to produce the amount of light.

20. The automated product specification system according to claim 19, further including means for converting the input identifying light products from traditional lighting to fiber optic lighting and vice versa.

21. The automated product specification system according to claim 19, further including means for accepting an order for the user via remote electronic communications interface, the order indicating at least one lighting product for the transaction data, and means for processing the order to complete a sale for the at least one lighting product for the transaction.

22. A method for lighting design comprising the steps of:
providing an application server provider including at least one computer host in connection with data transmission lines, the at least one computer host including a database and software for accessing the database and reading, writing, and storing data therein, and capable of being accessed via Internet connection and through a website; providing at least one remote computer in connection with data transmission lines, the at least one remote computer capable of accessing the Internet; a user accessing the application service provider via Internet connection; the user entering a user identifier and a user passcode for creating a file; the user entering predetermined data for lighting design specifications and requirements; and the user selecting lighting design options presented on the application server provider based upon the predetermined data entered by the user and the application service provider database and software; wherein the database and software of the application service provider comprise lighting design software for use in designing and specifying lighting.

23. The method for lighting design according to claim 22, further comprising the steps of selecting a icon representing at least one lighting product for at least one manufacturer, the icon being displayed on a remote screen for the remote user and functioning as a live link to detailed specifications and information on the at least one lighting product for at least one manufacturer.

24. The method for lighting design according to claim 23 wherein the live links are stored in an application server provider database.
Possible Actions are to select a button or from a pull down menu like View -> {Illuminators, Optical Fibers, Fixtures, Accessories}

Window 1: Initial Window Option 1

FIGURE 1
Assemble a remote source lighting system by selecting a port configuration and dragging it onto the canvas.

**Figure 3**
End Fixture Gallery Window

This window appears by performing the following action: View -> [End Fixtures]

Window 2: Remote Source Lighting System Layout

![Diagram of End Fixture Gallery Window]

Select an end fixtures.

FIGURE 4
End Fixture Photometric Report Ø Type Interior

Note: Most of the graphs can be manipulated dynamically by double clicking the graph and varying the dependant data.

Window 2: Remote Source Lighting System Layout

**Horizon Photometric Report**: Interior

**Description**: Photometric report prepared for end fixture optical fiber M1 from manufacturer RSLI. Catalog Number: 1234

- **Candelpower summary**: Calculated from measured data in database.
- **Zonal Lumens and %**: Calculated from eqn. 2.0.1
- **Luminance summary**: Calculated from eqn. 2.

**Fiber Geometry**

- **Length**: 10
- **Bend Radius**:
  - 1: 10
  - 2: 15

**Fixture Position**

- **Angle**: 15
- **Height above ground**: 10

FIGURE 5
End Fixture Photometric Report of Type Flood

Note: Most of the graphs can be manipulated dynamically by double clicking the graph and varying the dependent data.

Window 2: Remote Source Lighting System Layout

Fiber Geometry

- Band 1: 10
- Band 2: 15

Fixture Position

- Angle 15
- Height above ground

Tables and Graphs for a selected lighting component (optical fiber or end fixture)
Configure PhotoGen

1: editProperties()

FOR Each property

2: setValue(String, String, boolean)

END FOR

3: writeToDB()

4: update()

Update photogen.ini file.

FIGURE 10B
FIGURE 10F
Select a Different Illuminator

GUI: View Property Window

1. Display LightingComponentProperties (LightingComponent)
   - Retrieve all LC properties and display.
   - getManufacturer()
   - getModelNumber()
   - getSerialNumber()
   - buttonRefresh()

   6. aMeasuredDataExist(String, String, String)
      - FOR Each Successor
        - getDataTypeKey()
        - aSuccessorDataExist(String, String)
          - END FOR
      - END IF

User selects a different illuminator and presses the "Refresh Properties" button

- User selects the "LC" button

- Perform "Calculate LC Light Output" case
View Lighting Component Photometric Report

1. generatePhotometricReport (LightingComponent)
   IF (LC is interior)
     2. calculateIntensityDistribution (OpticalFiber)
   ELSE
     3. bentOpticalFiber (float, float, float)
   END IF
   4. init (LightingComponent)
   END IF
   5. calculate (*)
   6. getLightOutput (*)
   Calculate the following:
   1. Candlepower Summary
   2. Zonal Lumes
   3. Luminance Summary
   4. Coefficients of Utilization
   END IF

7. displayPhotometricReport (PhotometricReport)

User modifies optical fiber emitted fixture geometry

8. setLength
9. addLength (int, float)
10. calculate (*)
11. refreshPhotometricReport (Photometric)

Manipulate and dynamically update specific photometric report data.

Refer to "Calculate I.C Light Output" use case to retrieve measured data

END IF

Multiply intensity distribution by lumens and return matrix.
FIGURE 12
Photometric Data Classes

```
EnumBase

PhotometricFormatType
- CIBSE: int
- IESNA: int
- PROMETRIC: int

PhotometricReportType
- $FLOOD$: int
- $INTERIOR$: int
- $ROADWAY$: int
- $THEATER$: int

PhotometricReport
- init(lightingComponent: LightingComponent): void
  calculate(): void

AreaGeometry
- name: String
- length: float
- width: float
- height: float
- ceilingReflectance: float
- floorReflectance: float
- wallReflectance: float

OpticalFiberSubsystem
- init(): void
- calculateLightOutput(opticalFiber: OpticalFiber, lightInput: float): float
- calculateIntensityDistribution(opticalFiber: OpticalFiber): void

FiberCalc
- $numberOfDays$: int = 5000
- $numberOfOpticalFibers$: int = 5

File
- IESFile
```

FIGURE 13
The following links represent lighting products used in the attached file:

- www.remotelight.com/designer1/lgt1mp034.html
- www.remotelight.com/designer1/lgtfix093.html
- www.remotelight.com/designer1/lgtfix032.html
- www.remotelight.com/designer1/lmp05432.html

FIGURE 16