Lighting problems

Willdan investigated lighting problems reported by the staff of , where approximately 3 ballasts and 16 lamps are failing each week. After finding several instances of incompatible equipment, Willdan recommends a comprehensive review of the installed lighting.

The incompatible equipment should have been found during planning, installation, or building inspection. While the incompatible equipment remains in place, will have the continual expense of ballast and lamp replacement as equipment fails.

The analysis in this brief report is based on a site inspection by Willdan on December 12, 2014, and a review of the building drawings provided to Willdan by .

Ceiling-mounted fixtures

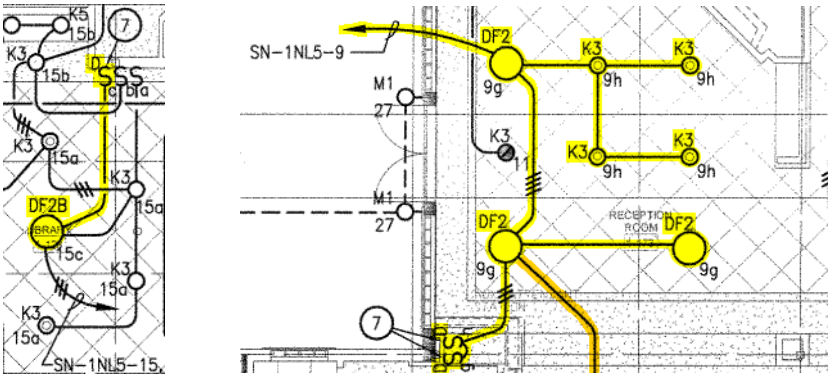
Some ceiling-mounted fixtures in common areas are controlled by dimmers; however, the spare ballast and lamp seen by Willdan are not dimmable. Willdan recommends further inspection to identify which dimmers, ballasts, and lamps are incompatible.

Specified fixtures

The specified fixtures, manufactured by Hubbardton Forge, were the Tryne model (style 124422) and Exos model (style 126503). A note on the lighting fixture schedule says that decorative fixtures were owner furnished and contractor installed. The Tryne model was specified with one 40 watt circline fluorescent lamp (see fixture type DF2 on the lighting fixture schedule, drawing 1.E0.3, 1/20/12). The Exos model was specified with three 13 watt compact fluorescent lamps (see fixture type DF2B). Dimming lamps and ballasts for the fixtures were not noted on the lighting fixture schedule.

The specified wiring included dimmers for 21 ceiling-mounted fixtures (see figure 1, copied from the lighting plan, drawings 1.E3.1, 1/20/12, and 1.E3.3, 9/30/11). The specified dimmer was a Lutron Maestro. The same fixture types (DF2 and DF2B) were specified without dimmers in other locations, such as corridor lighting.

Figure 1. Sample electrical circuits with ceiling-mounted fixtures and dimmers



Source: Detail of library room 1-128 (left) and reception room 1-173 (right) on the lighting plan, drawing 1.E3.1, 1/20/12, highlights added. Sheet note 7 says, "Wall dimmer—preset, 120 V, Lutron Maestro Series." The symbol for a dimmer switch, S_D, is specified on the electrical symbol schedule, drawing 1.E0.1, 1/27/12.

Installed fixtures

The installed fixtures are the specified fixtures. A spare Tryne model, examined by Willdan, has a TCP ballast, model 17040Q, and a TCP 40 watt T6 circline fluorescent lamp, model 32040 (see figure 2). The ballast and lamp manufactured by TCP are included with the fixture manufactured by Hubbardton Forge. (During a comprehensive review of the installed lighting, Willdan will confirm whether the installed fixtures have the same ballast and lamp as the spare fixture, as assumed.)

The installed dimmer is a Lutron Diva, a preset 120 volt dimmer, model DVF-103P (see figure 3).

Figure 2. Ceiling-mounted fixture, ballast, and lamp in storage

Source: **Photographs by Willdan at a site inspection of [redacted], 12/12/14.**

Figure 3. Dimmer for common area lighting

Source: **Photographs by Willdan at a site inspection of [redacted], 12/12/14.**

The ballast and lamp do not function properly on a dimmer, according to a TCP representative contacted by Willdan. The dimmer causes premature failure. The TCP representative stated that the product warranty is void if the ballast and lamp are installed with a dimmer.

Willdan is available to make a comprehensive review of the installed lighting and recommend compatible equipment.

Recessed downlight fixtures

Some recessed downlight fixtures in common areas are controlled by dimmers; however, the spare ballast and lamp seen by Willdan are incompatible with the dimmers. Willdan recommends further inspection to identify which dimmers, ballasts, and lamps are incompatible.

Specified fixtures

The specified fixture was a Philips Capri Recessed Compact Fluorescent, described as a 6 inch diameter fluorescent downlight with clear specular reflector and two lamps (see fixture type K3 on the lighting fixture schedule, drawing 1.E0.3, 1/20/12). The specifications had a discrepancy. The

catalog number, CFR62H13Q, indicated 13 watt lamps. The lamp type, CFQ18, indicated 18 watt lamps (see figure 4).

Figure 4. Recessed downlight fixture on the lighting fixture schedule

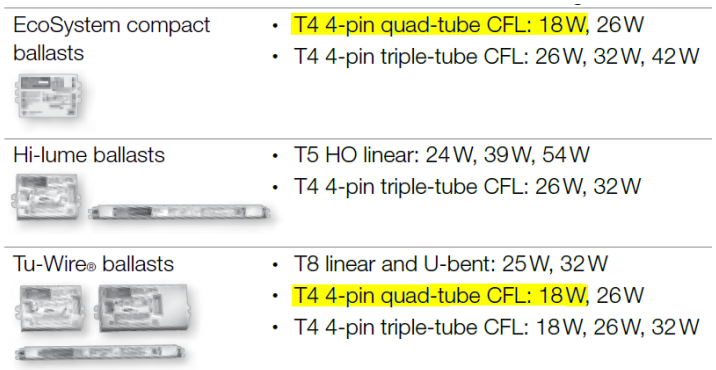
LIGHTING FIXTURE SCHEDULE

TYPE	MFR (1)	CATALOG NO. (1)	DESCRIPTION	MTG.	LAMP TYPE	LAMP No.
K3	CAPRI	CFR62H13Q–U–R6202	6" DIA. FLUORESCENT DOWNLIGHT WITH CLEAR SPECULAR REFLECTOR.	CEILING RECESSED	CFQ18	2

Source: **Detail of fixture type K3 on the lighting fixture schedule, drawing 1.E0.3, 1/20/12. Highlights added to show a discrepancy between the fixture and lamp specifications.**

The fixture was specified "with dimming ballast where shown on plan." It was the only fixture with a note about dimming on the lighting fixture schedule. Another note on the drawing said, "Where dimming is required, provide 1% dimming utilizing Lutron Hi-lume ballast and compatible Lutron dimmer switch for 1% dimming" (lighting fixture schedule, general note 7, drawing 1.E0.3, 1/20/12). The specifications misidentified the ballast that is compatible with the lamps, which is a Lutron EcoSystem ballast for three-wire control or Tu-Wire ballast for two-wire control (see figure 5).

Figure 5. Lutron fluorescent dimming ballasts and compatible lamp types and wattages



Source: **Detail of a table of Lutron fluorescent dimming ballasts from *Lutron Fluorescent Dimming Systems Technical Guide*, 2011, http://www.lutron.com/TechnicalDocumentLibrary/366-606_FDS_TG.pdf. Highlights added to show the lamp in the recessed downlight fixtures.**

The specified wiring included dimmers for 30 recessed downlight fixtures (see figure 1). The specified dimmer was a Lutron Maestro (sheet note 7 on drawing 1.E3.1, 1/20/12, and sheet note 4 on drawing 1.E3.3, 9/30/11). The same fixture type (K3) was specified without dimmers in other locations, such as corridor lighting.

Installed fixtures

The installed fixture is the specified fixture, but the installed ballast is not the specified ballast. A spare fixture, examined by Willdan, is a Philips recessed downlight fixture, model CFR62H18QDX1. The fixture's ballast is a Philips Mark 10 Advance Powerline, model REZ-2Q18-M2-BS (see figure 6).

Figure 6. Recessed downlight fixture, labels, and lamp in storage

Source: **Photographs by Willdan at a site inspection of [redacted], 12/12/14.**

(During a comprehensive review of the installed lighting, Willdan will confirm whether the installed fixtures have the same ballast and lamp as the spare fixture, as assumed.)

Neither the installed dimmer nor the specified dimmer is recommended for the installed ballast. The installed dimmer is a Lutron Diva model DVF-103P, which uses three-wire control (see figure 3). The recommended dimmer, according to Lutron, is a model that uses two-wire control (see figure 7).

Figure 7. Dimmers recommended by Lutron for use with Philips Advance Mark 10 Powerline ballasts

Lutron Dimmers for Controlling Advance Mark X® Electronic Ballasts (Powerline 2-wire line voltage control)				
120 Volts				
Lutron Dimmer Family	**Lutron Dimmer Model Number**	**Max. Capacity (A)**	**Instruction Sheet**	**Specification Submittal**
Nova	NFTU-5A	5	031373	369615
Nova T*	NTFTU-5A	5	0301630	369616
Diva® Satin Colors®	DVSCFTU-5A3P	5	0301307	367070
Diva	DVFTU-5A3P	5	0301307	366498
Skylark®	SFTU-5A3P	5	0301307	369684

Source: **Detail of a table of Lutron dimmers that have been tested to provide the proper control voltages for Advance Mark X Powerline Dimming Ballasts, http://www.lutron.com/en-US/general/Pages/Advance/AdvanceBallast.aspx.**

The spare lamp, examined by Willdan, is a Sylvania Dulux D/E Ecologic, model CF13DD/E/835 (see figure 6). The lamp is only 13 watts, which is correct for the recessed downlight fixture in patient rooms but not in common areas, which require 18 watt lamps. If a 13 watt lamp is used with a ballast for 18 watt lamps, the ballast is not damaged. However, the lamp overheats and fails, according to the Philips Lighting technician contacted by Willdan.

Multifunction fixtures

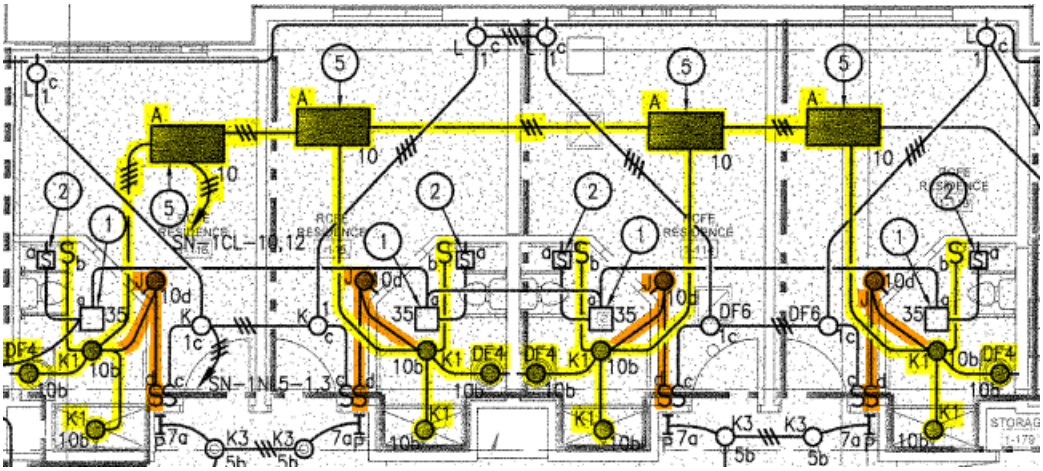
The multifunction fixtures in patient rooms have flickering LEDs, according to patient complaints. Willdan recommends further inspection to check that the fixture is properly wired.

Specified fixtures

The specified fixture was a Philips Alkco Multi-Med, described as a 2'×4' multifunction patient room lighting system providing ambient, patient reading, and exam lights, with a low-voltage controller, six 40 watt lamps, and three ballasts (see fixture type A on the lighting fixture schedule, drawing 1.E0.3, 1/20/12). Also, an approved equal was allowed instead of the specified fixture (sheet note 1, drawing 1.E0.3, 1/20/12).

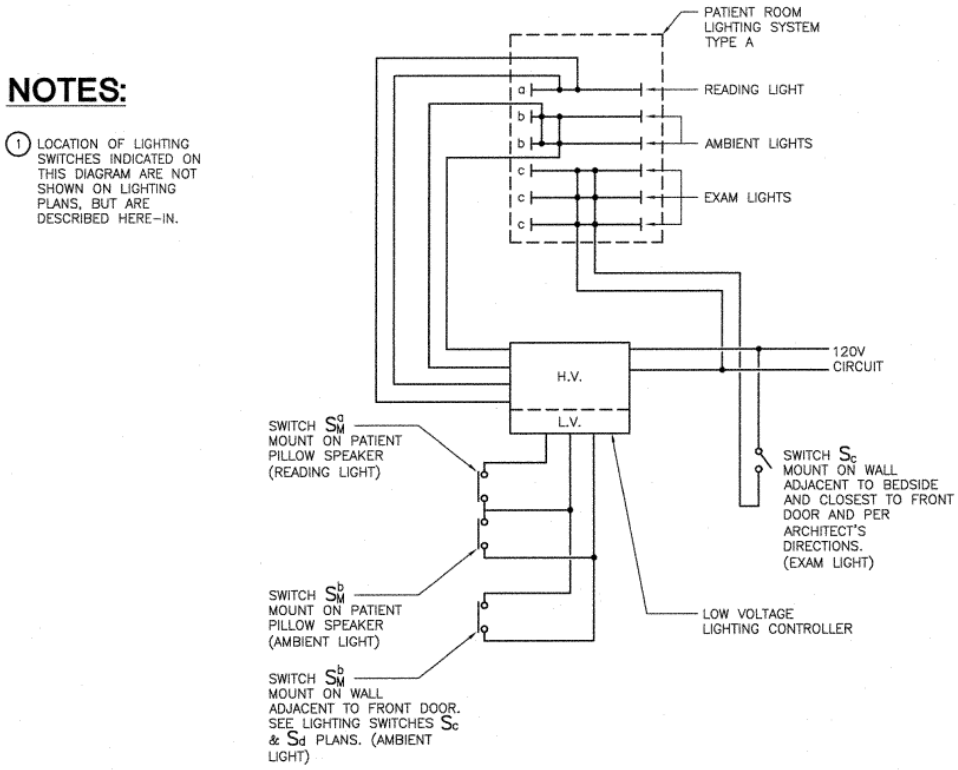
The specified wiring included the multifunction fixture on a circuit with LED step lights (type J), CFL recessed downlight fixtures (type K1), and CFL vanity fixtures (type DF4). The specified switches were nondimming (see figure 8; drawings 1.E3.1, 1/20/12, and 1.E3.3, 9/30/11). Also, the specified wiring included a low voltage lighting controller for the multifunction fixture and switches on the patient pillow speaker (see figure 9; drawing 1.E0.2, 1/20/12).

Figure 8. Sample electrical circuit with the multifunction fixture (lighting fixture type A)



Source: **Detail of rooms 1-113 to 1-116 on the lighting plan, drawing 1.E3.1, 1/20/12. Highlights are added to show circuit SN-1CL-10. About fixture type A, sheet note 5 says, "Refer to wiring diagram 1/1.E0.2 for switching of patient lighting system." For the wiring diagram, see figure 9.**

Figure 9. Wiring diagram for the multifunction fixture



Source: **Detail of drawing 1.E0.2, 1/20/12.**

Installed fixtures

The installed fixture was identified by Willdan, from its appearance, as a Cooper Lighting Medical Ambient Exam (MAE) fixture with LED reading lights (figure 10). The installed fixture is controlled by nondimming wall switches and an Ascom/GE Telligence patient station, call cord, and pillow speaker.

Figure 10. Installed multifunction fixture, wall switches, patient station, and pillow speaker

Source: **Photographs by Willdan at a site inspection of , 12/12/14.**