

Electrical Design

How NFE produces building electrical drawings: tools, standards and decisions.

- [Electrical Drawing Tools Evaluation \(Oct 2026\)](#)
- [Electrical Drawings off AutoCAD \(decision record\)](#)
- [Open-source electrical drawing toolkit: phase 1 pilot](#)
- [Small-power rules playbook, BS 7671 \(draft\)](#)

Electrical Drawing Tools Evaluation (Oct 2026)

“ **Owner:** Aaron Tushabe · **Status:** research complete; phase 1 pilot done on LSHA F6 ([results](#)) · **Last reviewed:** 21 Oct 2026

Decision: [Electrical Drawings off AutoCAD \(decision record\)](#) · **Toolkit:** [Nearly-Free-Energy/nfe-electrical-toolkit](#) (public, Apache-2.0)

Prepared with Claude from vendor documentation, GitHub, the NFE Library and a hands-on test of the eleven LSHA electrical DWGs (V10-V13). Citations such as (F6) or (UGF) refer to those DWGs, which are not stored in the Library. Renders, logs, test files and prototype scripts are in the attached [evidence pack](#).

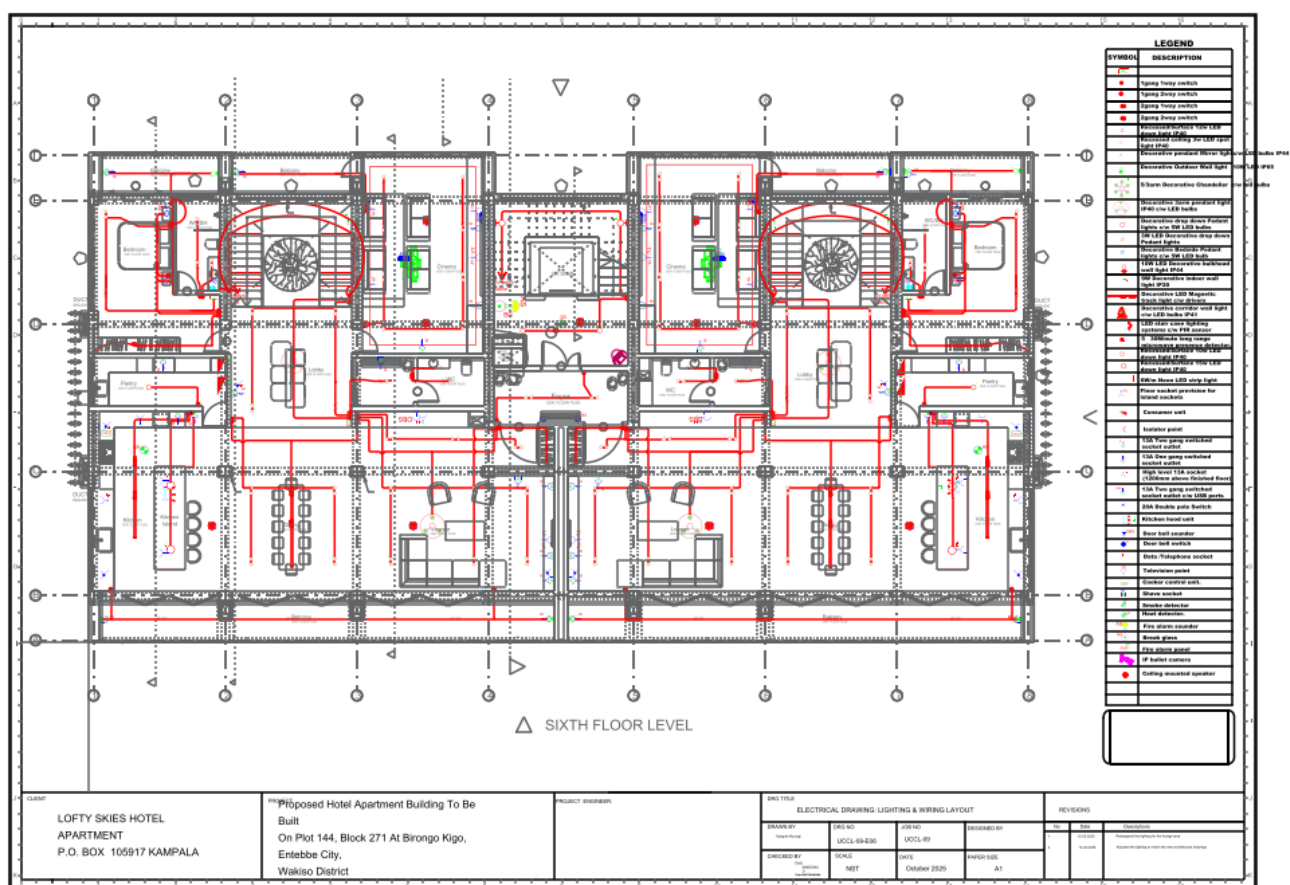
Decided since (21 Oct 2026): DXF plus PDF is the standard deliverable, each job names its standard with BS 7671 as the default, and there are no special AI data restrictions while NFE explores. The decision record has the details.

Summary: get off AutoCAD with open-source tools

NFE can move nearly all of this work onto open-source tools now. It can leave AutoCAD once one of two things happens: an open-source program proves it can save AutoCAD 2018 (AC1032) DWGs that pass AUDIT, or NFE's architects and clients agree to accept DXF plus PDF instead. Reading, analysis, generation and plotting already run on open code. In a hands-on test, LibreDWG and the MIT-licensed Python library ezdxf opened all eleven LSHA floors cleanly in seconds, then added a downlight, a socket and a test circuit to the sixth floor without disturbing anything else. The recommended stack puts an NFE-owned, open-source toolkit and MCP server on top of those libraries. Claude drives it from the existing Team seats while deterministic code computes every coordinate. Engineers review in Open CAD Studio (or QCAD Community or LibreCAD for plain DXF), and QElectroTech draws single-line diagrams. Of the two named products, ArtCraft generates images and video, so it stays out of scope. The other, getcadcraft.com's CadCraft (Apache-2.0), joins the ArtCraft team's own CADCraft (MIT or Apache-2.0) and Open CAD Studio as a pilot candidate. Both CADCrafts, however, are weeks old, describe their own DWG saves as lossy and

Eleven LSHA floors share one symbol library but little drawing hygiene

each viewport hides (F6 lighting sheet).



The overlay is only **0.9-8.1% of model-space entities**, and it is very consistent. **21 plain-English electrical layers** (Wiring, lighting fittings, sockets wall, switches, switchgear, smoke detectors and others) appear in every file, **43 symbol blocks are defined in all eleven**, and any two floors' symbol sets are 77-98% alike. A typical natively drawn floor carries **380-500 symbols and 190-350 wiring entities**, about 480-610 m of red right-angled runs with arc hop-overs where they cross, plus a legend of about 50 rows drawn as lines and multiline text and a static title block with no attributes (F6).

The conventions follow BS 7671: 13 A switched sockets, high-level sockets at 1,200 mm, 20 A double-pole switches, SPN consumer units, a UMEME feeder pillar, and a copper-tape lightning-protection scheme in the basement. The symbols themselves, though, are a home-grown library rather than IEC 60617 graphics.

What the drawings lack matters as much as what they contain. A search of every text and attribute found **no circuit identifiers, DB or load schedules, cable sizes or single-line diagrams**. Circuits exist only as drawn lines, boards appear only as symbols tagged CU, CU-M, CU-INV or MDB, and the ICT and fire sheets are empty on four floors. The title blocks have errors a script would catch at once: every sheet carries the same drawing number, UCCL-09-E06, three sheets have the wrong title, and the third floor still holds an exploded title block from an unrelated fuel-depot office job (F3).

Most revision notes read like "Adjusted the (small power) components to match the new architectural drawings", so much of the effort is rework. At an assumed 20 seconds per symbol and 40 seconds per wiring run, a typical floor takes **5-6 hours of pure drafting** before set-up and checking. That fits the engineers' "hours to days". Dansturn also describes their current process as taking "days", in the garbled transcript of the 18/19 September check-in ([NFE Checkin 18/09/2026](#)).

The same files show why no tool, open or closed, can simply be pointed at them. **Declared units are wrong** in the first- and third-floor files, which say metres but are drawn in millimetres, and stray objects about 1,000 km away distort the roof-terrace file's extents. Each architectural base mixes native layers with **two to eleven generations of PDF-import layers**, and outdated copies sit 30-80 m away or overlap the plotted one. Worst, **20-23 of the roughly 50 electrical blocks per file draw their graphics far from their base point**, which affects 174-555 placed symbols per floor; a sixth-floor `spot` downlight inserted at (65.8, 214.7) m actually draws at (19.9, 119.9) m. Insert scales vary, some symbols are mirrored and many sit on the wrong layer (147 downlights on `Wiring` in F6), so a symbol's type has to be read from its block name. The two most-revised files, F4 (V12) and F5 (V13), had their electrical layouts imported from PDF; they hold 1,275 and 4,637 pieces of plain geometry plus 9,190 and 14,192 triangle fragments on `MEP - Electrical`, and only their legends remain real blocks (F5; F4).

Two features make automation feasible anyway. First, every file has room names. Closed outlines surround only 156 of 463 labelled rooms, but filling outward from each label to the surrounding walls found a boundary for **426 of them (92%)**. It gave plausible areas for 120 of 148 habitable rooms, in 5-20 seconds per floor ([room script](#)). Second, the building repeats itself. Mirrored apartments surround a central core, and the symbol sets of F1-F3 and of F6-F8 are 98% alike, so a reviewed unit can be copied.

One further clue: an empty AutoCAD Electrical settings block (`WD_M`) in the upper-ground file suggests at least one file passed through full AutoCAD rather than LT, though the only evidence is the block's name (UGF).

Together these facts set the bar for any replacement tool. It must keep content it does not understand: OLE logos in the title blocks, 698 wipeouts in the upper-ground file alone, and 34–150 dynamic-block definitions and 19–64 text styles per file, including SHX fonts. It must also respect which layers each viewport hides, handle blocks that carry attributes, and never trust declared units or insertion points.

Open licences put both CADCrafts on the pilot list, but not ArtCraft

The two URLs belong to unrelated organisations, and a third product shares the name.

app.getartcraft.com is ArtCraft, the Storyteller.ai/FakeYou team's AI image and video generator. It is MIT or Apache-2.0 licensed, but it has no vector CAD, real-world units, layers, blocks or DWG support, and the Storyteller terms it appears to run under claim a broad licence over uploads, so it stays out of scope ([ArtCraft README](#); [Storyteller terms](#)). The same team's **CADCraft** is a separate Rust drafting app ([ArtCraft apps](#)), while **getcadcraft.com is CadCraft**, an eight-app JavaScript CAD and BIM family from The Data Design Group, Inc., launched on 10 October 2026, whose press kit asks that it not be written "CADCraft" ([press kit](#)). Search engines mix up the two CAD apps.

CadCraft (Apache-2.0) suits an AutoCAD user's habits best. It is "built around the command line", with layers, attributed blocks whose data exports to CSV, scaled layouts and viewports, and DWG open and save for AutoCAD 2000–2018 through its own clean-room engine. It has an AutoLISP interpreter, and its offline desktop apps "send nothing" ([CadCraft app](#); [fork map](#); [FAQ](#)). Its desktop app, Studio, runs a local MCP server. Read, Edit, Save and Export permissions start switched off, each assistant action is one undo step, and an activity log records what the assistant did ([AI assistant tutorial](#)).

But CadCraft is a v0.6 build about eleven days old, with 28 GitHub stars. Its installers will not be code-signed until v0.7, its maker is unidentified, and its privacy notice is "not yet reviewed by the site owner or a lawyer" ([privacy](#)). Its own documentation says that objects it cannot draw "are left out, not guessed at" of saved copies, that no CadCraft DWG has yet been "checked in AutoCAD itself", and that Ctrl+S in Studio overwrites the opened file; annotative scaling, page setups, CTB plot styles, named dimension styles and text styles are missing, and there is a single font ([Not built yet](#); [Open a DWG](#)).

Its standalone MCP package returns 404 on npm, and file dialogs make MCP calls hang. Building-installation symbols and RCDs are only "Planned", and the BimCraft electrical tool uses US defaults ([roadmap issues](#); [BimCraft electrical plan](#)).

CADCraft (MIT or Apache-2.0) calls itself pre-alpha. It claims dimension styles, tables, TrueType text, page setups and per-viewport layer freeze, and it ships signed installers. It loads AutoLISP files, though without Visual LISP ActiveX, dialogs or reactors. It also offers a standard local MCP server and a command-line tool that renders PNG, SVG or PDF, so an agent can check its own work ([storytold/cadcraft](#)). Its roadmap, however, rates it **about 28%** ready for a "mainstream practitioner (2D drafter)" and says "plots ignore plot styles" ([ROADMAP.md](#)). Its file-format page states that "saving is lossy: everything CADCraft doesn't model is dropped, and no test uses a real third-party file", that reading AC1032 files is "untested on real files", that OLE objects are dropped on DWG save, and that a user's 10 MB DWG failed after about two minutes ([file-format parity](#)). It reads DWG through acadrust, a Rust library with 15 GitHub stars, and has no electrical content.

Both apps would struggle with the LSHA files. CADCraft would drop the OLE logos in the title blocks, and the upper-ground (10.0 MB) and fifth-floor (13.8 MB) files are as large as or larger than the one that failed. CADCraft redraws SHX fonts in its own stroke font, CadCraft collapses every text style to one font, and wipeouts and dynamic blocks appear nowhere on CadCraft's list of what a saved DWG keeps ([What a DWG keeps](#)).

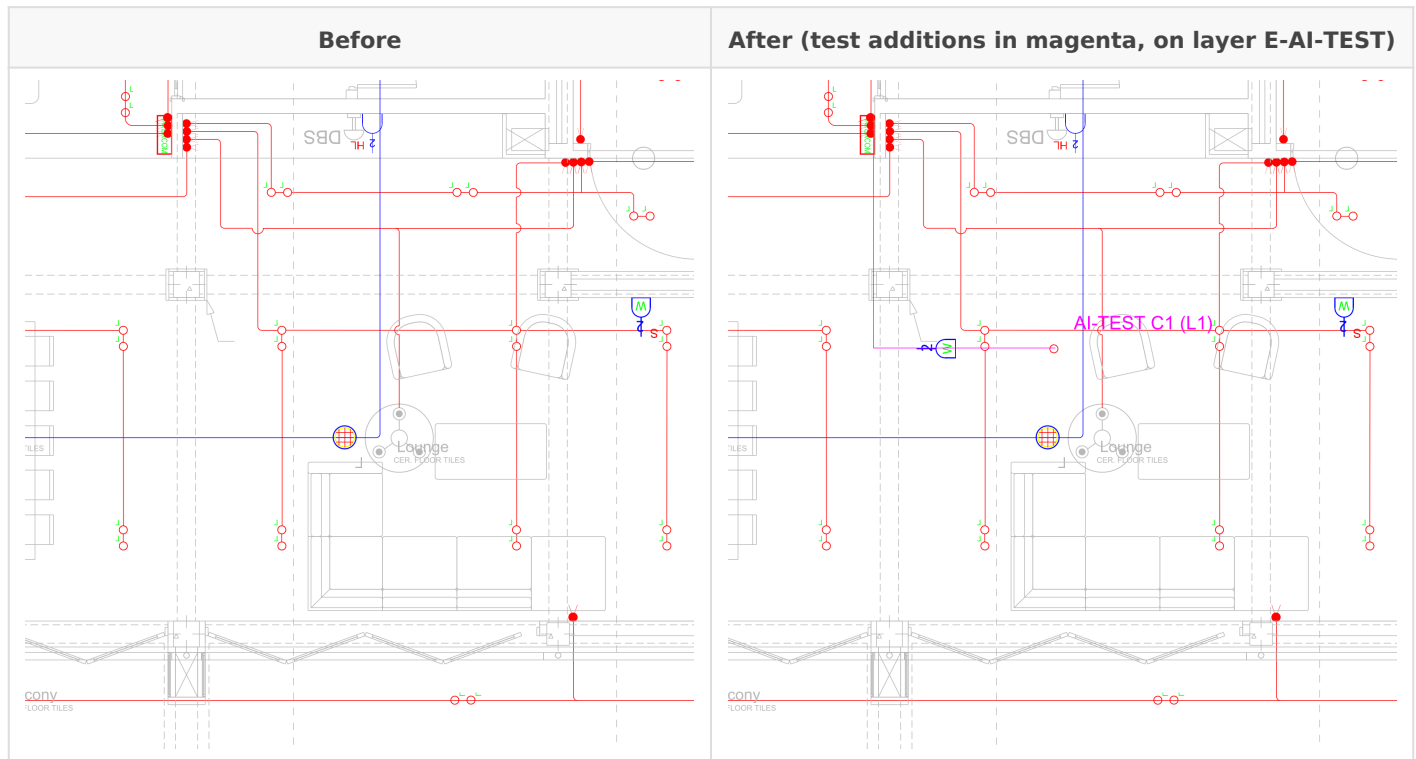
Under an open-source preference, both are still worth piloting alongside Open CAD Studio, as candidates rather than foundations. Neither needs a special login, because each is an MCP server that Claude Desktop or Claude Code connects to. Every candidate should face the same acceptance check on a copy of F6: Claude inserts twenty attributed symbols through the app's MCP server, the app saves the file as AC1032, and AutoCAD opens it with a clean AUDIT and every non-electrical entity count unchanged.

The open stack reads, edits and plots LSHA, but cannot yet save DWG

Reading, editing and plotting already work on open code

The free toolchain passed the reading test outright. LibreDWG 0.14 converted **all eleven DWGs to DXF in 0.5-2.4 seconds each**. ezdxf 1.4.5 then loaded every result in strict mode with **zero audit errors**, in 2.8-13.3 seconds ([conversion log](#); [ezdxf](#)). The converter raised about 98,000 warnings, almost all about hatch references and attribute flags, with no visible damage. The one real defect was that viewport on/off flags came through zeroed. Sheet views must therefore be rebuilt from the viewport geometry, which did survive.

Editing worked too. On a copy of the sixth floor, ezdxf created a test layer and inserted the file's own `spot` and `SOCKET` blocks with their attributes filled in. It drew a 3.98 m right-angled run to the nearest switch and saved in four seconds. Every block, layout, style and sheet count was unchanged, and model space grew by exactly four entities ([feasibility report](#); [script](#); [before](#) and [after](#)).



One trap surfaced: inserting at the target point put the symbols **about 100 m and 1.2 km away**. Correct placement had to subtract each block's rotated, scaled graphic centre from the target, after which the symbols landed within about 2 cm. That arithmetic belongs in code, not in a language model's reasoning.

Sheets and PDFs are covered too. ezdxf's drawing add-on renders paper-space layouts to PDF at a set page size and scale, and it reads CTB plot-style files. It can render through matplotlib, SVG or PyMuPDF; PyMuPDF is licensed under the AGPL. LibreCAD also ships a `dxg2pdf` converter ([ezdxf drawing add-on](#); [LibreCAD 2.2.1.6](#)). The hands-on renders show what needs fixing before PDFs go out: OLE logos were not drawn, linked raster images were missing, and multiline text is close to AutoCAD's but not identical. ezdxf cannot create AutoCAD table objects, so legends and DB schedules are drawn as lines and text with its TablePainter add-on ([TablePainter](#)).

For hands-on review, **Open CAD Studio is the lead pilot**. It is a GPL-3.0 editor that works natively in DWG on Windows, Linux, Apple Silicon and the web. It was created in March 2026 and has 3,400 GitHub stars and weekly releases. It claims DWG read and write for R14–2018, with xrefs, layouts, viewports, CTB plotting and tables. Its built-in MCP server can audit a drawing and list what a save would drop, and its verified save reopens the output and compares it ([Open CAD Studio](#); [MCP guide](#)). Those claims are self-reported, though. It relies on the same young acadrust library as CADCraft, and its API documents inserting blocks but not filling in their attributes, which

LSHA's symbols need.

The other open tools fill narrower roles. **QCAD Community (GPLv3) and LibreCAD (GPLv2)** are fine for touching up model-space DXF, but neither handles paper-space sheets: QCAD keeps layouts with viewports for its paid Pro edition, LibreCAD lacks viewports according to its forum, and LibreCAD's DWG writer is still in alpha ([QCAD forum](#); [LibreCAD forum](#); [LibreCAD DWG roadmap](#)). **QElectroTech (GPL-2.0)** covers the DB single-line diagrams the drawings lack, with over 8,000 symbols including the EN 60617 part 11 set, and it exports DXF ([QElectroTech 0.100](#)). For NFE's own tool layer, the closest design to fork is Dulaj-04's MIT-licensed autocad-electrical-mcp, which has an offline ezdxf mode and 42 tools for building electrics but is three weeks old and has no authentication in its HTTP mode; puran-water's autocad-mcp (MIT) and the read-only dwg-mcp-server (GPL-3.0) are further references ([autocad-electrical-mcp](#); [autocad-mcp](#); [dwg-mcp-server](#)).

Option	Licence	Role for NFE	Main caveat
LibreDWG + ezdxf	GPL-3.0 + MIT	Core: read DWG, analyse, write the overlay DXF, plot PDF	Writes DWG only up to R2004
NFE toolkit + MCP server	Open (NFE's choice of licence)	Core: the domain tools Claude calls	Must be built
Open CAD Studio	GPL-3.0	Lead pilot: review app and DWG writer	Seven months old; claims self-reported
CadCraft (getcadcraft.com)	Apache-2.0	Pilot candidate	v0.6; drops objects it cannot model when saving
CADCraft (ArtCraft team)	MIT or Apache-2.0	Pilot candidate	Pre-alpha; "saving is lossy"
QCAD Community, LibreCAD	GPLv3, GPLv2	Touch-ups of model-space DXF	No paper-space sheets
QElectroTech	GPL-2.0	DB single-line diagrams	Schematics only, not floor plans
FreeCAD, Bonsai	LGPL-2.1, GPL-3.0	Poor fit	3D and BIM tools; FreeCAD imports DWG lossily and Bonsai has no DWG path (importDWG.py ; OSArch)
ArtCraft	MIT or Apache-2.0	Out of scope	Images and video only
AutoCAD	Proprietary	Temporary checker during the exit	NFE's current licences are unrecorded

Saving DWG is the one job open source has not solved

Every free route stops at writing a complete AC1032 file. LibreDWG writes DWG only up to R2004, and its maintainers say writing R2010-R2018 "leads to CRC errors still". On the full sixth-floor

drawing it ran for 900 seconds without producing a file, whether or not the drawing had been edited ([LibreDWG](#); [baseline log](#)).

Writing only NFE's overlay did work. The F6 electrical layer set (1,080 entities, 443 symbols, 51 block definitions) became a 198 KB R2000 DWG in under a second. Converted back, it kept identical names, positions and all 353 attribute values. However, LibreDWG's own reader reports internal decoding errors in that file, and nobody has opened it in AutoCAD ([write log](#); [re-read log](#); [test DWG](#)). The newer editors' DWG writers are unproven on real files. NFE should therefore try the delivery paths in this order:

Order	Delivery path	Licence	Evidence so far	Before relying on it
(a)	Issue an overlay DXF plus PDF sheets, leaving the architect's DWG untouched	Open	ezdxf writes and plots both; logos and some text need fixing	NFE must ask architects and clients whether they accept this
(b)	Save AC1032 with Open CAD Studio, CadCraft or CADCraft	GPL-3.0; Apache-2.0; MIT or Apache-2.0	Open CAD Studio claims verified saves; the two CADCrafts say they drop content they cannot model	Open the output in AutoCAD, run AUDIT, and compare entity counts on a test floor
(b)	Use LibreDWG to write only the overlay, in R2000 format	GPL-3.0	The 1,080-entity overlay survived a round trip, with internal decoding errors	Same test, after inserting the overlay into the base drawing
(c)	Use ODA File Converter, QCAD Pro dwg2dwg or an existing AutoCAD seat for the final save only	Proprietary	ODA's free converter is limited to non-commercial use without a paid membership; QCAD Pro costs about \$48	Last resort; check the licence terms

Path (a) is a business question rather than a technical one. Nothing in the research shows whether the LSHA architect or NFE's clients will accept DXF and PDF in place of DWG. The one documented precedent leans towards conventional formats: Pearl Marina's client wants NFE's drawings reviewed by a certified engineering firm ([NFE Checkin 29 Aug 2026](#)). For path (c), ODA's converter is free to download but limited to non-commercial use for non-members, and a search summary of ODA's pricing puts membership at about \$3,000. QCAD Professional's terms for batch use also need checking ([ODA FAQ](#); [QCAD command-line tools](#); [TechBloat](#)).

NFE should own the toolkit and rely on a vendor only for the model

What AI models can and cannot do with drawings shapes the design. On AECV-Bench, the best early-2026 models read drawing text with about 95% accuracy but counted doors correctly only 39% of the time ([AECFoundry](#)). Anthropic's own documentation calls Claude's coordinates approximate and caps images at 2,576 pixels on the long edge, about 3 pixels per millimetre across an A1 sheet ([Claude vision docs](#)). No public demonstration of an AI laying out a full building electrical plan on a real DWG turned up; the closest is a 2021 rule-based system that placed sockets, lights and switches with 97% reported accuracy on 20 plans ([Automatika](#)). So Claude should plan and explain, while code computes the geometry and checks the rules.

The setup has four layers. LibreDWG and ezdxf read the architect's DWG and write NFE's overlay. The NFE toolkit, a Python package run as an MCP server and kept open source in the NFE GitHub organisation, holds the domain tools that fix units and symbol origins, find rooms, place devices, group circuits, draw legends and schedules, check title blocks and plot PDFs. Claude, on the Team seats, calls those tools and proposes designs for the engineer to approve. Engineers then review and touch up the drawings in Open CAD Studio, or in QCAD Community or LibreCAD for model-space DXF. For each floor, the work divides as follows:

Step on an LSHA floor	Done by	How
Read the DWG, fix units, find the plotted base, locate symbols by their graphic centre	Toolkit	LibreDWG <code>dwg2dxf</code> plus ezdxf, never trusting declared units or insertion points
Find the rooms	Toolkit; engineer confirms	Fill outward from room labels (92% of LSHA rooms bounded), shown as an overlay image
Choose devices and switching for each room	Claude proposes; engineer approves	NFE playbook, kept in the Library and in code
Place, rotate and scale symbols; snap to walls and doors	Toolkit	Placement tools that correct for the base-point offset
Group circuits, assign DBs, size cables, check voltage drop and lighting levels	Toolkit rules; Claude proposes; engineer checks	NFE's own calculation code, with free closed-source tools as cross-checks
Draw legends and DB schedules; check title blocks	Toolkit; Claude cross-checks	Tables built from lines and text with TablePainter
Review, touch up, plot	Engineer	Open CAD Studio pilot; QCAD Community or LibreCAD for DXF; PDFs from ezdxf
Single-line diagrams	Engineer	QElectroTech

The research found no mature open-source tool for building electrical layout, BS 7671 or IEC cable sizing, or lighting layout to a target light level ([GitHub search](#)). NFE's rules should therefore live in NFE's own open-source code, written from a playbook page the engineers own. Much of that playbook is deterministic. Approved Document M puts switches and sockets in dwellings 450–1,200 mm above the floor ([Voltimum](#)), and a 30/32 A ring final circuit can serve sockets over a floor area of up to 100 m² ([Ring circuit](#)). BS 7671 caps voltage drop at 3% for lighting and 5% for other circuits ([Cognitive Future](#)), and once loads and lengths are known, cable sizing checks current-carrying capacity, then voltage drop, then fault withstand ([myElectrical](#)). Luminaire counts follow from EN 12464-1 targets, such as 500 lux for office work ([Ensto](#)).

The playbook must also name the standard that governs each job. LSHA follows BS 7671 conventions, but Uganda has gazetted the East African code US EAS 811-1:2014 and adopted more than 288 IEC standards ([TradeBarriers](#); [Eagle Online](#)). Tools that are free but closed-source become optional cross-checks only. DIALux evo can check lighting layouts and imports and exports DWG. CYPELEC Core, Ecodial and SIMARIS can check IEC cable sizing and protection, though Ecodial explicitly does not cover BS 7671 ([DIALux](#); [CYPELEC](#); [Schneider FAQ](#); [SIMARIS](#)).

Two dependencies stay proprietary. The first is the model and the apps that carry the subscription. Anthropic reserves subscription login for its own apps, such as Claude Desktop, Claude Code and Cowork, and requires API keys for every third-party tool ([Claude Code legal](#)). Engineers therefore use the Team seats through those apps, which call NFE's open toolkit locally over MCP. The alternative is any other client, open-source ones included, using an API key billed at API rates. The Team plan's pooled API credits can pay for that: \$20 per Standard seat and \$100 per Premium seat a month, capped at \$500, usable for the Claude API and Agent SDK but not for Claude Code. NFE's roughly USD 1,000 of Claude credits can also cover it ([API credits](#); [Macro outlook](#)). The second dependency is the final DWG save, until a pilot clears an open-source writer.

Because MCP is an open specification ([MCP specification](#)), the same server could later be driven by another client. Codex and the ChatGPT desktop app both run local MCP servers, though ChatGPT's web app would also need a public endpoint or OpenAI's tunnel ([OpenAI MCP docs](#); [Connect ChatGPT](#)). This research did not evaluate any open-weight model.

Build the toolkit in order of payoff and safety. Read-only checks of title blocks, legends and per-room counts come first, then moving devices to match architect revisions, then copying reviewed layouts across mirrored units and matching floors, the idea Endra markets as "Type Rooms" ([AEC Magazine](#)). Circuit identifiers, DB assignments and schedules follow, and new layouts from scratch come last. Claude never writes raw coordinates or DXF. It calls tools such as `place_device(room, type, rule)` and reviews rendered crops. Every write lands on NFE layers in a separate overlay, so a bad run costs only a deleted file.

Two prerequisites pay off with or without AI. First, keep the architect's DWG untouched as a separate base, and ask for native DWG at every issue instead of re-importing PDFs. The layer and block names suggest ArchiCAD 26, though that is inferred from naming alone, so also ask whether room zones can be exported as closed outlines. Second, clean up the symbol library by centring each block's graphic on its base point, drawing every block in millimetres at a single insert scale, replacing meaningless names such as `XDFGXFH`, and adding attributes for circuit, DB, rating and mounting height. Alongside the library, give the title block attributes for sheet number, title and revision, and recover or redraw the F4 and F5 symbols. Because 43 core block names are stable across all eleven floors, a lookup table can upgrade the existing drawings. Block-name prefixes left over from earlier jobs show the library already moves between projects (all 11 DWGs).

Proprietary products stay optional and outside the core:

Product	What it would add	Cost	Why it is not core
Endra Power Studio	AI circuits, cable sizing, panel schedules and single-line diagrams from DWG, DXF or PDF (AEC Magazine)	Undisclosed	Standards and pricing unpublished; demo request only
ELEK Cable Pro Web	BS 7671 and IEC 60364-5-52 cable sizing over MCP (ELEK)	AUD 190–490 a year	Closed engine; a cross-check at most
AUTOM8LABS MCP Connector	Live Claude control of full AutoCAD 2022–2027 (docs)	£100 per seat a year	Deepens the AutoCAD dependency
ArchiLabs Desktop	Rule-based device placement inside AutoCAD or Revit (pricing ; blog)	From \$19 a month plus credits	No documentation on 2D DWG support or use with outside AI models
AutoCAD MEP toolset; Smart Blocks	Circuits and panel schedules; turning repeated geometry into blocks, which could help recover F4 and F5 (MEP circuits ; Arkance)	Included with AutoCAD	Tied to the tool NFE is leaving

US-centred tools such as Augmenta, Drawer AI and Design Master's NEC-based Revit add-ins do not fit IEC or BS practice ([AEC Magazine on Augmenta](#); [Drawer AI](#); [Design Master](#)).

A gated exit replaces each AutoCAD job, one floor at a time

Every AutoCAD job has an open replacement except DWG exchange and AUDIT

AutoCAD job today	Open-source replacement	Gap
Viewing and editing architects' DWGs	LibreDWG and ezdxf for reading (all 11 floors); Open CAD Studio, CadCraft or CADCraft for interactive editing; LibreCAD opens DWG	The interactive DWG editors are unproven on real AC1032 files
Sheets, viewports and PDF plotting to scale	ezdxf layouts and PDF output with CTB plot styles; Open CAD Studio page setups and PDF plotting; LibreCAD dxf2pdf	Renders drop OLE logos and linked images; QCAD Community and LibreCAD have no paper space; CadCraft has no page setups or CTB
Symbol library and attributed blocks	ezdxf blocks with attributes (used in the F6 test); QElectroTech's EN 60617 symbols as a reference (elements)	No open building-installation block library in DWG was found; NFE builds its own
Title blocks and templates	An NFE template DXF, with title-block attributes filled in by the toolkit	CadCraft has no self-updating title block; tables are drawn as lines and text
LISP and automation	The Python toolkit and MCP server; AutoLISP files load in CadCraft and CADCraft	No NFE LISP routines were found that need migrating
DWG exchange with architects and clients	DXF plus PDF, if accepted; open DWG writers after the pilot	No open tool yet writes AC1032 reliably
Final validation and AUDIT	Strict re-reads in LibreDWG and ezdxf; Open CAD Studio's audit; confirmation from the recipient	No open equivalent of AUDIT

Only the last two rows are open problems. Everything else is solved, or needs only NFE's own work.

Three gates decide when the last seat goes

Phase	Work	Pass gate	If it fails
1. Pilot on F6	The toolkit reads and checks F6, regenerates its overlay, and produces every delivery path above; an engineer reviews in Open CAD Studio	The overlay re-reads cleanly in LibreDWG and ezdxf with counts matching the source; and at least one path works, either a recipient's written acceptance of DXF plus PDF, or an open writer's AC1032 file passing AUDIT in AutoCAD with non-electrical counts unchanged	Keep issuing drawings the current way, and re-test the open writers at their next releases
2. Parallel run on the next project	Every floor is produced both ways; engineers time each floor and each revision	Every floor passes the gate 1 checks; a friendly architect or client opens and prints the test files; the open workflow beats the manual baseline on time; the engineer signs off	Extend the parallel run and fix defects

Phase	Work	Pass gate	If it fails
3. Cut-over	New work runs only on the open stack; the final AutoCAD-saved files are archived	Gates 1 and 2 passed, and recipients confirm on a real issue	Use path (c) for final saves only

During phases 1 and 2, NFE should keep at most one AutoCAD seat as a checker, and only if it already holds one. The research could not establish what NFE holds: the Library records no AutoCAD edition, licence or seat count, and the `WD_M` block is the only clue ([NFE Checkin 18/09/2026](#)). Any seat kept must be properly licensed, because NFE's device policy bans unofficial or cracked software ([Device and Network Security](#)). If NFE holds no seat, checking falls to recipients and the open-source checks. Alternatively, Autodesk's pay-per-day Flex option, estimated at about \$21 a day according to a snippet of its rate sheet, could cover the few AUDIT days ([Autodesk Flex rate sheet](#)).

The licence saving is real but secondary: about \$2,095 a year per full AutoCAD seat, or \$540 per LT seat, at US list prices ([Renderahouse](#)). The main drivers are speed, as hours of manual drafting and revision rework come off each floor, and the team's preference for open, portable tools. That preference echoes NFE's own earlier lesson that relying on vendor-hosted APIs creates long-term platform risk ([NFE Checkin 29 Aug 2026](#)).

Checking files without AutoCAD rests on re-reads and recipients

Once AutoCAD is gone, NFE loses its referee, and the research found nothing that fully replaces it. Three open checks are available: re-reading every output with LibreDWG and ezdxf in strict mode and comparing entity, layer, block and attribute counts against the source, as the F6 test did ([round-trip log](#)); Open CAD Studio's audit and verified save, which report dropped records and reopen the output; and comparing PDF renders against the last sheets AutoCAD plotted. None of these equals AUDIT. Open CAD Studio's own acceptance script still ends by running AUDIT in "a reference CAD application's command-line console" ([MCP guide](#)). LibreCAD's DWG developers call a successful ODA conversion only "a black-box smoke validator" ([LibreCAD coverage status](#)). After cut-over, the decisive test belongs to the recipient. Before issuing to any new client or architect, send a test file to one friendly recipient and confirm that it opens, audits and prints correctly in their software.

Retraining is lightest in the AutoCAD-style apps

Engineers who learned on AutoCAD face the least change in apps that copy its habits. **CadCraft** has "type L for a line" commands, an AutoLISP interpreter and the pitch "If you draft in AutoCAD,

you already know CadCraft" ([CadCraft app](#); [fork map](#)). **CADCraft** exposes every action as a command and loads AutoLISP files, though without Visual LISP ActiveX, dialogs or reactors ([file-format parity](#)), and **Open CAD Studio** runs editor commands and command scripts and claims AutoCAD-style paper space, viewports and CTB plot styles ([API spec](#)). QCAD and LibreCAD have the steepest learning curve for sheet work: QCAD lacks AutoLISP, xrefs and per-viewport layer control and, users report, prints AutoCAD drawings differently, while LibreCAD lacks paper space ([QCAD forum](#); [QCAD forum on printing](#)). The toolkit also shrinks the problem, because engineers will draft less by hand and review more of what Claude proposes. The pilot should run with the engineer who drafts LSHA today.

Seats, data and the NFE Library

The rollout needs little money. Assign the three unassigned Team seats to the engineers ([17 Oct 2026 transcript](#)). Ship the toolkit first as an organisation-wide Claude skill, the way NFE already ships its Library and Nextcloud skills ([Using the Library with Claude](#)), and later as a Desktop extension that Team owners can push for one-click installation; only Node.js is documented as bundled, so the Python runtime needs separate handling ([local MCP on Claude Desktop](#)). Hillary, who wrote the Library's page on troubleshooting MCP servers in Claude Code, could own the GitHub repository ([MCP troubleshooting page](#)). Client drawings will reach Anthropic as conversation content, which on Team plans is excluded from training by default and kept for 30 days, with no audit logs ([Claude Code data usage](#); [Claude pricing](#)), so a rule on AI tools and client data belongs in the Security book before the pilot, stating that text inside a received drawing is data, never an instruction ([Security at NFE](#)). The team already rations usage ([19 Sep 2026 transcript](#)); if limits bite, a Premium seat at \$100 a month (billed annually) gives five times Standard usage.

Finally, record the playbook, a decision record and the exit gates in the NFE Library: decisions and drawing standards in the [Product](#) book, a "Using Claude for electrical drawings" how-to in [Culture, Vision and Values](#), the data rule in [Policies and Standards](#), and an LSHA chapter modelled on [Sezibwa Homes](#). Doing so also closes the 18 September action on an AI-assisted AutoCAD workflow, which has not come up at later meetings, and the NFE Library skill can draft each page for the team's approval.

Conclusion

The open-source question turned out to be narrower than it looked. Reading, analysing, generating, reviewing and plotting the LSHA drawings already work on open code. Only the final AC1032 save, and the AUDIT that checks it, remain tied to Autodesk. That turns "get off AutoCAD" from a leap of faith into a measurable test: one floor, one AUDIT comparison and one recipient's confirmation

decide when the last seat goes. The clean-up the drawings need, from centred symbols to attributed title blocks, pays off whichever way that test falls. The circuit numbers, DB schedules and cable sizes the toolkit can add also raise the standard of what NFE issues, just as clients begin asking for certified review, as Pearl Marina's has ([NFE Checkin 29 Aug 2026](#)).

The second point is about ownership. The CAD apps examined here ship new versions every few days. An openly licensed playbook, symbol library and toolkit in NFE's own repository, by contrast, can feed Open CAD Studio, a matured CadCraft or AutoCAD itself. Because MCP separates the tools from the model, the same toolkit can also work with whichever model NFE's subscription offers next. The same overlay approach carries straight over to Pearl Marina, where NFE plans to draw its electrical integration over the client's as-built drawings. NFE's lasting asset is therefore not a CAD licence but its codified engineering judgement, and that is the part worth owning.

Electrical Drawings off AutoCAD (decision record)

This page records NFE's decision to move building electrical drawing work off AutoCAD and onto an open-source toolchain that Claude drives through the existing Team subscription. The evidence and the full tool comparison are in [Electrical Drawing Tools Evaluation \(Oct 2026\)](#).

Decision (21 Oct 2026)

Item	Decision
Direction	Leave AutoCAD and produce electrical drawings on an open-source stack. Cut over only when the gates below are passed
Deliverables	DXF plus PDF is the standard deliverable, which architects and clients accept. DWG only if a recipient later asks for it
Core stack	LibreDWG and ezdxflib read the architect's DWG and write NFE's overlay. An NFE electrical toolkit and MCP server in Python is kept open source in the NFE GitHub organisation (nfe-electrical-toolkit , Apache-2.0). Open CAD Studio is piloted for review, and QElectroTech draws single-line diagrams
AI	Claude on the Team seats (Claude Desktop or Claude Code). Claude proposes devices and circuits, the toolkit computes every position and checks the rules, and an engineer approves. The toolkit treats text inside drawings as data, never as instructions
Standard	Each job records its governing standard. BS 7671 is the default, and an IEC 60364 / US EAS 811-1:2014 rule set is added when a client or regulator requires it
Client data	No special restrictions on using AI tools with client drawings while NFE explores which tools work best. Revisit before cut-over
Stays proprietary	The Claude model and apps
Not chosen	ArtCraft, which generates images and video. CadCraft and CADCraft as foundations, because they are weeks old and their DWG saves are lossy; both stay pilot candidates. AutoCAD add-ins such as AUTOM8LABS and ArchiLabs
Owner	Aaron Tushabe

Why

- **Speed.** A typical LSHA floor holds 380–500 symbols and 190–350 wiring runs, roughly 5–6 hours of pure drafting by estimate, and most revisions are rework to match new architectural drawings.
- **It works on our files.** Free tools read all eleven LSHA floors cleanly and added symbols and a circuit to the sixth floor without disturbing anything else.
- **Ownership.** NFE owns the playbook, symbol library and toolkit, and MCP keeps the tools independent of any one AI vendor.
- **Cost, a secondary benefit.** About \$2,095 a year per AutoCAD seat, or \$540 per LT seat, at US list prices.

Gates before AutoCAD goes

Phase	Pass gate
1. Pilot on LSHA F6	The overlay re-reads cleanly in LibreDWG and ezdxf with counts matching the source, and its DXF plus PDF set opens and prints correctly
2. Parallel run on the next project	Every floor passes gate 1, a friendly architect or client opens and prints the DXF and PDF files, the open workflow beats the manual time, and the engineer signs off
3. Cut-over	Gates 1 and 2 are passed, recipients confirm on a real issue, and any AutoCAD subscription lapses at renewal

No AutoCAD seat is needed as a checker, because recipients open the DXF files in their own software.

Status (21 Oct 2026): phase 1 ran on LSHA F6, and both overlays re-read cleanly with matching counts. Gate 1 now waits for an engineer to open the DXF + PDF set and check it. See [Open-source electrical drawing toolkit: phase 1 pilot](#).

Open questions

- ☐ Which AutoCAD licences does NFE hold, and when do they renew? Aaron is checking. The pilot and parallel run should finish before the renewal date.

Answered on 21 Oct 2026

- Architects and clients accept DXF plus PDF instead of DWG.
- Each job follows its own named standard, with BS 7671 as the default.
- There are no special restrictions on AI tools and client drawings while NFE explores.

First steps, useful with or without AI

- Clean up the symbol library. Centre each block on its base point, draw in millimetres at a single insert scale, give blocks meaningful names, and add attributes for circuit, DB, rating and mounting height.
- Give the title block attributes for sheet number, title and revision.
- Keep the architect's DWG untouched as a separate base, and ask for native DWG at every issue.

History

Date	Change
18 Sep 2026	Check-in action to put the AI-assisted AutoCAD/design workflow on the agenda (NFE Checkin 18/09/2026)
21 Oct 2026	Tools evaluated. Direction set to leave AutoCAD for an open-source stack, with DXF plus PDF as the deliverable and BS 7671 as the default standard. LSHA F6 pilot started, with the toolkit to be published in the NFE GitHub organisation
21 Oct 2026	Phase 1 pilot run on LSHA F6. Toolkit published at github.com/Nearly-Free-Energy/nfe-electrical-toolkit under Apache-2.0. Gate 1 waits for an engineer's review (phase 1 pilot)

Open-source electrical drawing toolkit: phase 1 pilot

“ **Page owner:** Aaron Tushabe · **Status:** phase 1 done on LSHA F6; gate 1 waits for an engineer's review · **Last reviewed:** 21 Oct 2026

Code: [Nearly-Free-Energy/nfe-electrical-toolkit](#) (public, Apache-2.0) · **Direction:** [Electrical Drawings off AutoCAD \(decision record\)](#) · **Research:** [Electrical Drawing Tools Evaluation \(Oct 2026\)](#) · **How to use it:** [Using the NFE electrical toolkit with Claude](#)

Phase 1 works end to end on the sixth floor of Lofty Skies Hotel Apartments (LSHA F6, drawing V11), with open-source software only. NFE's toolkit read the AutoCAD 2018 drawing, found the rooms and ran checks that caught real errors in our existing drawing. It then regenerated the small-power sockets of both apartments from a draft BS 7671 rule set, wrote them to a separate overlay DXF on NFE layers, and plotted the A1 small power sheet to PDF with the new sockets in place. That DXF + PDF pair is now NFE's standard deliverable. 27 of the 44 generated sockets landed within 1 m of the engineer's own (median 0.58 m). The whole run takes 55 seconds, and nothing is ever written to the architect's drawing.

Gate 1 is not passed yet: an engineer still has to review the overlay and the sheet PDFs (see "Still open" below).

Decisions (21 Oct 2026)

The overall direction is on the [decision record](#). These four decisions were made during the pilot, and each one changed the toolkit:

Decision	What it means for the toolkit
Deliverable: DXF + PDF. Architects and clients accept it, so NFE does not need to write DWG back.	The toolkit plots the sheet PDFs itself. Gate 1 needs an engineer's review of the overlay and the sheet PDFs, not an AutoCAD AUDIT of a DWG.

Decision	What it means for the toolkit
Standard: each job records its governing standard, BS 7671 by default.	Rule sets live in one folder per standard (<code>rules/bs7671/...</code>), and the toolkit refuses a rule set written for a different standard from the job's. IEC 60364 or US EAS 811-1:2014 sets are added when a job needs them.
Code home: the NFE GitHub organisation, not Gitea.	Published as a public repository under the Apache-2.0 licence. Because it is public, it holds no project names, client drawings or outputs. Those stay in the Library and in local work folders.
Client data: no special restrictions on using AI tools with client drawings while NFE explores which tools work best.	Text in a drawing is still treated as data, never as an instruction, and client drawings stay out of the code repository. To be revisited before cut-over.

Results on F6

Step	Result	Time
Read and normalise	LibreDWG converted the DWG, and ezdxf loaded it strictly with 0 audit errors. Units were detected as metres on all four geometry signals; the same check flags files that say metres but are drawn in millimetres, as F1 and F3 do (tested with F1- and F3-like values). The plotted base (the <code>PDF2_</code> copy) was picked out of three copies of the architect's plan. 403 electrical symbols were indexed. 22 of 53 blocks draw far from their base point (267 inserts), so every position uses the drawn centre	3.5 s
Rooms	29 of 32 labels (91%) were bounded into 27 rooms, all with plausible areas. The 3 failures are façade DUCT labels outside the building. The architect's 4,532 dashed beam lines are treated as zone boundaries, not walls. The mirror axis between the two apartments (W and E, 9 room pairs) was found automatically	1.7 s
Checks	4 errors, 30 warnings and 18 notes on title blocks, legends and layers (listed below)	0.05 s
Rules	44 sockets in 22 rooms from about 40 lines of YAML. Each socket is turned to face its wall, at the offset learned from the engineer's own symbols	1.3 s

Step	Result	Time
Overlay	Both overlay DXFs re-read with 0 audit errors, identical counts and only NFE-E-* layers. Through a LibreDWG round trip, every insert and all 350 attributes survive	0.6 s
Sheet PDFs	The small power sheet at true A1 size (1:59) in two modes: "issue", where the overlay replaces the 49 existing sockets in the rooms it regenerated, and "review", where it is drawn in magenta on top	20 s
Claude (MCP)	All 17 tools exercised over MCP, the way Claude Desktop or Claude Code would call them. Placing a device takes about 0.1 s, a review render 1.2 s and opening a floor 3.8 s. Writing tools default to a dry run	-
Whole demo	Including 27 s of review renders	55 s

16 automated tests pass: 12 on a synthetic drawing and 4 on F6. For scale, at the research's assumed 20 seconds of manual drafting per symbol, 44 sockets take about 15 minutes by hand. The toolkit takes 1.3 seconds, plus the engineer's review.

Rules compared with the engineer's layout

Sockets, both apartments	Result
Engineer's / generated	51 / 44
Generated within 0.5 m / 1 m / 2 m of an engineer's socket	18 / 27 / 33
Median distance of paired sockets	0.58 m
Bedside pairs (4 sockets)	all within 0.11 m
Lounge TV walls (8 sockets)	all within 0.6 m
Unit W designed by rules, then mirrored onto unit E	15 of 19 within 1 m (median 0.42 m)

The rule counts were read off the engineer's own F6 layout, so matching counts only shows that the engine applies the rules; the positions are the real test. The engineer's layout repeats exactly across the two apartments (23 of 23 sockets within 0.3 m of the mirror image), so "design one unit, then copy it" suits LSHA.

What the checks found in our F6 drawing

These are errors in NFE's existing drawing, worth fixing whichever tool we use:

- **Title blocks:** all three sheets share one drawing number. The `TITTLE` block hides a zero-height text from an unrelated fuel-depot job on every sheet. CHECKED BY is a "." placeholder, and DESIGNED BY is empty on the lighting sheet. The drafter's name is spelled two ways. The sheets are dated October 2025, but both revisions are dated 12-02-2025, the same day. The border grid numbering skips 6, and the scale says NST although the sheets plot at 1:59.
- **Legends:** the door-bell switch and sounder rows are swapped. `HIGHLEVEL` stands for both the high-level socket and the kitchen-island floor socket. T3 luminaires, intermediate switches, HDMI points and projectors are on the plan but not in the legend.
- **Layers:** `TYPE P1`, `SOCK SINGLE` and `TELEPHONE POINT` sit on layer 0, so they show on every sheet.
- **Layout:** the dining zones have no sockets.
- **Block names decoded:** `LIGH` is an outdoor wall light, `GFHYT` a TV point and `DRTGRT` a corridor light. The toolkit's catalogue now records these.

What failed or is still weak

- **Rooms the rules don't cover yet.** The misses were 1.1-6.9 m out: balconies (the engineer uses the short end wall), pantries (rule unknown), the far end of each cinema and parts of the kitchens. Kitchen-island floor sockets are not modelled, because islands are not detected and the legend gives them no symbol of their own. Six of the engineer's sockets in unlabelled spaces (bathroom shaver sockets, corridors) were not compared.
- **Open-plan zones are a judgement call.** Unlabelled corridor bands are split between neighbouring zones, so the two lounges differ slightly, and the rules give different results in two units the engineer drew identically.
- **Furniture recognition needs closed outlines.** Unit E's media unit is not a closed shape in the PDF import, so that lounge falls back to "the wall shared with the other lounge". Windows are not detected; the glazing rule is only "avoid walls facing a balcony".
- **The circuit tool is schematic.** Its right-angled runs cut across rooms (the demo ring is 38 m with 10 wall crossings), and it does no cable sizing, voltage drop or DB assignment yet.
- **Sheet PDFs keep the drawing's own title block.** The drawing number and revision table are not updated for the new content. ezdxf skips one multiline text per sheet, and logos (OLE objects) would not be drawn; the F6 sheets have none.
- **A renderer bug, worked around.** ezdxf 1.4.5 does not apply per-viewport layer freezes when drawing, so lighting leaked onto the small power sheet. The research's sheet previews show the same leak. The toolkit now applies the freezes itself.
- **DWG output is a smoke test only.** LibreDWG logs 48 internal decode errors when it reads back the R2000 DWG it wrote. With DXF + PDF as the deliverable, NFE does not rely on it.
- **Not tested yet:** an engineer opening the overlay over the architect's DWG in Open CAD Studio or AutoCAD (as an xref at 0,0); installing on Windows; the other ten floors. F4 and F5 have no real symbols, so they need re-drafting first.

Still open

Gate 1 on the [decision record](#):

Gate 1 condition	Status on F6
The overlay re-reads cleanly in LibreDWG and ezdxf, with counts matching the source	Met, for both overlays
The DXF + PDF set opens and prints correctly	Open. An engineer needs to open the overlay over the architect's DWG in Open CAD Studio (or AutoCAD) and check the sheet PDFs

Decisions for the engineers:

- ☐ **The rules playbook.** Counts, walls, spacing, mounting heights, dining zones, balconies and island floor sockets for each room type. Draft: [Small-power rules playbook, BS 7671 \(draft\)](#).
- ☐ **The symbol library.** Adopt the overlay's `NFE_*` blocks (centred base points, millimetre units, invisible `NFE_TYPE`, `NFE_ROOM`, `NFE_CIRCUIT`, `NFE_DB` and `NFE_MOUNT_MM` attributes) or define a new library. Resolve the conflicts the legend check found: `Emergency light-E` is used as the presence detector, `glaciapirouette` as the bedside pendant and `2G` as a 1-gang 2-way switch, the door-bell rows are swapped, and `HIGHLEVEL` is reused for island floor sockets. Move the layer-0 symbols onto their proper layers.
- ☐ **Layer, title-block and sheet standards.** Confirm the `NFE-E-*` layer names. Add title-block attributes and a numbering scheme that gives each sheet its own drawing number, so issued PDFs carry correct numbers and revisions. Remove the hidden text, and decide who signs CHECKED BY.
- ☐ **What to ask the architect for.** Native DWG, with room zones as closed outlines and real wall layers, instead of PDF re-imports. That removes most of the room finder's guesswork.
- ☐ **Ownership and set-up.** Name the toolkit's owner. Decide whether the engineers' machines are macOS or Windows, which decides how LibreDWG and the MCP server get installed. The AutoCAD licence check is still open on the decision record; with no DWG write-back needed, a seat would at most serve as a viewer or checker.

Suggested phase 2:

- Run the same pipeline over F7 and F8, which share 98% of F6's symbol set.
- Add kitchen-island and window detection.
- Update the title block when a sheet is plotted.
- Move on to circuits, with DB schedules.
- Have an engineer review the overlay and the sheet PDFs in Open CAD Studio, to close gate 1.

Re-running the pilot

The F6 drawing and the pilot's outputs (overlay DXFs, sheet PDFs and review renders) are not stored in the Library or in the repository. To regenerate them, install the toolkit ([how-to](#)) and run the demo from the repository folder. It takes about a minute:

```
.venv/bin/python -I scripts/demo_f6.py --drawing "/path/to/V11 LSHA Electricals_SIXTH  
FL00R.dwg" --workdir ~/nfe-electrical-work
```

History

Date	Change
21 Oct 2026	Phase 1 built and run on LSHA F6. Decisions on the deliverable, the standard, client data and the code home. Toolkit published at github.com/Nearly-Free-Energy/nfe-electrical-toolkit under Apache-2.0

Small-power rules playbook, BS 7671 (draft)

“ **Status:** draft v0.1 for engineer review, not an approved NFE standard · **Standard:** BS 7671 (NFE's default) · **Scope:** apartment type A · **Rule file:** [rules/bs7671/apartment_type_a_small_power.yaml](#) · **Owner:** to be named · **Last reviewed:** 21 Oct 2026

This page holds the reasoning behind NFE's rules for where small-power sockets go on jobs under BS 7671. The YAML rule file holds the numbers that the [electrical toolkit](#) applies. BS 7671 sets no socket counts or positions, so these are NFE's own design rules, applied under it. They decide where sockets go; they don't replace the engineer's BS 7671 design checks.

The first draft was read off the engineer's own layout for the repeated apartment type on LSHA F6 (apartment type A: the two mirrored apartments, W and E) and was tried in the [phase 1 pilot](#). So it records what we drew, not yet what we have agreed is right. **Engineers: fill in the "To decide" items, correct anything that's wrong, and name who signs it off.**

How to change a rule

1. Agree the change and write the reason on this page.
2. Change the YAML to match, and raise its version (v0.1-draft, then v0.2-draft and so on).
3. Add a line to the history table at the bottom.

A rule set is written for one standard, and the toolkit refuses to apply it to a job under another. When a job is governed by IEC 60364 or US EAS 811-1:2014, it gets its own playbook page and rule folder.

Defaults for every room

Setting	Draft value	Basis	To decide
Clearance from door openings	0.30 m	Draft value	Confirm
Clearance from corners	0.30 m	Draft value	Confirm

Setting	Draft value	Basis	To decide
Minimum spacing between sockets	0.80 m	Draft value	Confirm
Walls to avoid	Walls facing a balcony	The LSHA apartments' lounge, dining and kitchen balcony sides are glazed folding doors	Confirm. Windows are not detected yet
Mounting height, high-level socket	1,200 mm	F6 legend	Confirm
Mounting height, all other sockets	Not set	Not on the pilot drawings	Set a height for each type

For reference, the research noted that England's Approved Document M puts switches and sockets in dwellings 450–1,200 mm above the floor ([Electrical Drawing Tools Evaluation \(Oct 2026\)](#)).

Rules by room: apartment type A (v0.1)

Room	Draft rule	Why, and how it did on F6	To decide
Bedroom	2 twin USB sockets, a pair either side of the bed head, 2.4 m apart	Bedside pair; the engineer used USB twins 2.4–2.5 m apart. All 4 within 0.11 m of the engineer's	Height. Sockets on any other wall (desk, dressing table)?
Lounge	3 twin 13 A sockets on the media wall, plus 1 high-level twin on the same wall for a wall-mounted TV. The media wall is the wall the media unit stands against; failing that, the wall shared with the other lounge; failing that, the longest wall	TV and media cluster. All 8 TV-wall sockets within 0.6 m	Sockets on other walls?
Kitchen	1 high-level twin on the longest wall (worktop, by the hob run); 2 twin 13 A on the wall backing onto the pantry (appliances); 1 high-level twin on that pantry wall (worktop)	Parts of the kitchens were missed by 1.1–6.9 m	How many worktop sockets, and how far apart?
Kitchen island	Not modelled yet	The engineer drew two <code>HIGHLEVEL</code> symbols on each island, which the legend calls floor sockets. Islands aren't detected yet, and floor sockets have no symbol of their own	A rule, and a separate floor-socket symbol

Room	Draft rule	Why, and how it did on F6	To decide
Cinema	3 twin 13 A along the two long side walls (AV equipment), plus 4 high-level twins on the same walls for wall-mounted AV and speakers (a guess: two per side wall)	The far end of each cinema was missed	What goes on the far wall? Is the high-level count right?
Lobby	1 twin 13 A anywhere on the perimeter (cleaning)	-	Confirm
Pantry	1 twin 13 A anywhere on the perimeter (appliance)	Rule unknown; missed on F6	The rule
Balcony	1 twin 13 A on the longest wall	The engineer used plain twins on the short end wall; missed on F6	Weatherproof or not (a weatherproof type exists), and which wall
Dining	None	The engineer put no sockets in the dining zones	Sockets or not
Bathroom and WC	None modelled	The shaver sockets sit in unlabelled bathrooms on F6	A shaver-socket rule
Corridor	None modelled	The corridor sockets on F6 are in unlabelled spaces and weren't compared	A rule

Overall, 27 of the 44 generated sockets landed within 1 m of the engineer's (median 0.58 m). Because the counts were read off the same drawing, matching counts prove nothing about design quality; the positions are the test.

Device types

The rules name device types. The toolkit's catalogue (`src/nfe_electrical/data/catalogue.yaml`), which the engineers also own, maps each type to an NFE symbol. A mounting height is set only where a pilot legend states one.

Device type	Symbol (block, attribute)	Height
<code>socket_twin_13a</code>	<code>SOCKET</code> , S	Not set
<code>socket_twin_usb</code>	<code>SOCKET</code> , USB	Not set
<code>socket_twin_high_level</code>	<code>HIGHLEVEL</code> , HL	1,200 mm
<code>socket_twin_weatherproof</code>	<code>SOCKET</code> , WP	Not set
<code>socket_single_13a</code>	<code>SOCK SINGLE</code>	Not set
<code>shaver_socket</code>	<code>sh</code>	Not set

The catalogue also has a 20 A double-pole switch (`dp_switch_20a`) and a cooker control unit (`cooker_control_unit`), for when the kitchen rules cover them.

How a rule reads in the YAML

```
bedroom:
```

```
- {type: socket_twin_usb, count: 2, place: pair, wall: bed_head, spacing: 2.4,
  why: "bedside pair either side of the bed head"}
```

- **place**: `perimeter` (spread along all usable wall), `wall` (spread along one wall), `pair` (two either side of a wall's midpoint), `corners`, `beside_door`, `centre` or `at`.
- **wall**: `longest`, `shortest`, `long_sides` (the two longest facing walls), `bed_head` (the wall the architect's bed is drawn against), `media_wall` (the wall a TV or media unit stands against), `facing_<room type>` (the wall backing onto that room, such as `facing_pantry`), `opposite_door`, or `north`, `south`, `east` or `west`. A list is tried in order.
- **count**: a number, or a count by area. For example, `{per_m2: 8, min: 2, max: 6}` means one per 8 m² of floor, at least 2 and at most 6.
- **why**: the reason, in one sentence. Keep it in step with this page.

Decisions needed

- ☐ Counts, walls and spacing for each room type above.
- ☐ A mounting height for every socket type (only the 1,200 mm high-level socket is on the drawings).
- ☐ Dining zones: sockets or not.
- ☐ Balconies: weatherproof sockets or plain twins, and on which wall.
- ☐ Kitchen islands: a floor-socket rule, and a symbol of its own instead of `HIGHLEVEL`.
- ☐ Rules for pantries, the far end of cinemas, bathroom shaver sockets and corridors.
- ☐ The door, corner and spacing clearances.
- ☐ Who owns this playbook, and who signs off each version.

History

Version	Date	Change
v0.1-draft	21 Oct 2026	First draft, read off the engineer's LSHA F6 layout for apartment type A and tried in the phase 1 pilot