The Elevator

Source Companion

Ketineni Ramarao

References are separate from the book. Entries give an exact source address, the scope used and the chapters that cite it. Access descriptions distinguish fetched text from a search excerpt. Fetched text is not a claim that every page of a source was read. Figures retain their reporting dates and scopes; the company snapshot uses 2024 or FY2023/24 results, not a claim of latest 2026 financials.

Illustration provenance

The fourteen interior illustrations were generated for this book. They are conceptual illustrations, not archival photographs, documented views of particular installations or engineering drawings. Historical architecture and machines are interpretive. The plates are cropped to exclude human figures. The cover motif is original vector artwork. Charts were drawn from the cited historical figures; they are not photographs or generated evidence.

[2] Deaths and Injuries Involving Elevators or Escalators

Access: Fetched page/document text; relevant passages checked.

Use: Historical US accident reporting; not a per-trip global transport ranking.

Book locations: Prologue, Chapter 27

https://stacks.cdc.gov/view/cdc/221302

[3] Archimedes

Access: Fetched page/document text; relevant passages checked.

Use: Ancient accounts associate Archimedes with lever theory and compound pulleys.

Book locations: Chapter 1

https://kids.britannica.com/students/article/Archimedes/272938

[4] Elevators and platforms, or the machinery behind the show - Parco archeologico del Colosseo

Access: Fetched page/document text; relevant passages checked.

Use: The Colosseum hypogeum housed lifting platforms and capstan machinery.

Book locations: Chapter 2

https://colosseo.it/en/opere/elevators-and-platforms-or-the-machinery-behind-the-show/

[5] A New Recreation Shows How Ancient Romans Lifted Wild Animals Into the Colosseum

Access: Fetched page/document text; relevant passages checked.

Use: A reconstruction of a Colosseum lift raised a wolf in 2015.

Book locations: Chapter 2

https://www.smithsonianmag.com/travel/how-ancient-romans-got-wild-animals-colosseum-180955580/

[6] Agricola, De Re Metallica (catalogue)

Access: Fetched page/document text; relevant passages checked.

Use: Bibliographic identity of Agricola's 1556 mining treatise; the catalogue is not a full reading of its machinery chapters.

Book locations: Chapter 3

https://www.gutenberg.org/ebooks/38015

[7] National Trust: History of Levant

Access: Fetched page/document text; relevant passages checked.

Use: Levant's man engine failed in October 1919; 31 miners died.

Book locations: Chapter 3

https://www.nationaltrust.org.uk/visit/cornwall/levant-mine-and-beam-engine/history-of-levant-mine-and-beam-engine

[8] Ups & Downs: The Evolution of Elevators | Live Science

Access: Fetched page/document text; relevant passages checked.

Use: Survey of steam, hydraulic and electric elevator development.

Book locations: Chapter 4

https://www.livescience.com/57282-elevator-history.html

[9] The Project Gutenberg eBook of Elevator Systems of the Eiffel Tower, 1889, by Robert M. Vogel.

Access: Fetched page/document text; relevant passages checked.

Use: Historical hydraulic mechanisms and the Eiffel Tower's three lift systems.

Book locations: Chapter 5, Chapter 5A

https://www.gutenberg.org/files/32282/32282-h/32282-h.htm

[10] Hydraulic Power in London – Subterranea Britannica

Access: Fetched page/document text; relevant passages checked.

Use: London's hydraulic power network, pumping and accumulator infrastructure.

Book locations: Chapter 5

https://www.subbrit.org.uk/features/hydraulic-power-in-london/

[11] Eiffel Tower’s elevators, a lift to the top - OFFICIAL website

Access: Fetched page/document text; relevant passages checked.

Use: Eiffel Tower hydraulic installations and later lift development.

Book locations: Chapter 5, Chapter 12A

https://www.toureiffel.paris/en/the-monument/lifts

[12] Otis History | Elevator history timeline

Access: Fetched page/document text; relevant passages checked.

Use: Otis's safety-brake origins and company founding.

Book locations: Chapter 6

https://www.otis.com/en/us/our-company/history

[13] Otis History | Elevator history timeline

Access: Fetched page/document text; relevant passages checked.

Use: Otis dates its company to 1853 and first commercial passenger installation to 1857; historical timeline.

Book locations: Chapter 6, Chapter 7, Chapter 8, Chapter 21

https://www.otis.com/en/us/our-company/history

[14] Otis History | Elevator history timeline

Access: Fetched page/document text; relevant passages checked.

Use: Otis's account of the Crystal Palace demonstration. The familiar spoken line is a received historical account, not an audio record.

Book locations: Chapter 7

https://www.otis.com/en/us/our-company/history

[15] The Evolution of Elevators: Physical-Human Interface, Digital Interaction, and Megatall Buildings - Frontiers of Engineering - NCBI Bookshelf

Access: Fetched page/document text; relevant passages checked.

Use: Survey of the changing passenger interface, including early installations and automation.

Book locations: Chapter 8, Chapter 8A

https://www.ncbi.nlm.nih.gov/books/NBK481624/

[16] The Electric Elevator - Engineering and Technology History Wiki

Access: Fetched page/document text; relevant passages checked.

Use: Siemens demonstrated an electric elevator in Mannheim in 1880.

Book locations: Chapter 9, Chapter 37A

https://ethw.org/The_Electric_Elevator

[17] Mennens: Origins of wire rope

Access: Fetched page/document text; relevant passages checked.

Use: Julius Albert's successful wire-rope development in 1834; mining origins and parallel load-bearing strands.

Book locations: Chapter 10, Chapter 10A

https://www.mennens.nl/en/lifting-knowhow/file-steel-wire-rope/origins-of-steel-wire-rope

[18] Fred Hymans and the Theory of Rope Traction, Part Two - Elevator World

Access: Fetched page/document text; relevant passages checked.

Use: Fred Hymans and the analysis of rope traction.

Book locations: Chapter 10

https://elevatorworld.com/article/fred-hymans-and-the-theory-of-rope-traction-part-two/

[19] Otis History | Elevator history timeline

Access: Fetched page/document text; relevant passages checked.

Use: Otis timeline dates the improved gearless traction machine to 1903.

Book locations: Chapter 11

https://www.otis.com/en/us/our-company/history

[20] Equitable Building Designation Report

Access: Fetched page/document text; relevant passages checked.

Use: Equitable's earlier 1870 building and its passenger-elevator significance.

Book locations: Chapter 12

https://www.nyc.gov/assets/lpc/downloads/pdf/reports/equitable.pdf

[21] NOVA Online | Why the Towers Fell | Towers of Innovation | PBS

Access: Fetched page/document text; relevant passages checked.

Use: WTC express/local zoning and sky lobbies.

Book locations: Chapter 14

https://www.pbs.org/wgbh/nova/wtc/innovation2.html

[22] GIANTS: Walkthrough

Access: Fetched page/document text; relevant passages checked.

Use: WTC sky lobbies at floors 44 and 78; stacked zones and shaft-space economy.

Book locations: Chapter 14

https://old.skyscraper.org/EXHIBITIONS/GIANTS/walkthrough_elevators.htm

[24] Joshua B. Freeman, Working-Class New York, chapter excerpt

Access: Fetched page/document text; relevant passages checked.

Use: Freeman: 24 September 1945 strike, approximately 15,000 building-service workers; truce after five days.

Book locations: Chapter 15, Chapter 16

https://archive.nytimes.com/www.nytimes.com/books/first/f/freeman-newyork.html

[25] Remembering When Driverless Elevators Drew Skepticism : NPR

Access: Fetched page/document text; relevant passages checked.

Use: Public hesitation about operatorless elevators and the industry's reassurance campaign.

Book locations: Chapter 16, Chapter 17

https://www.npr.org/2015/07/31/427990392/remembering-when-driverless-elevators-drew-skepticism

[26] US371207A - Elevator - Google Patents

Access: Fetched page/document text; relevant passages checked.

Use: Alexander Miles's 1887 patent for car and landing-door operation; historical contribution, not sole invention of every modern interlock.

Book locations: Chapter 11A, Chapter 17

https://patents.google.com/patent/US371207A/en

[27] Traffic analysis based on the up-peak round-trip-time method

Access: Fetched page/document text; relevant passages checked.

Use: Round-trip time, handling capacity and interval in up-peak traffic analysis. No claim that the full Strakosch handbook was inspected.

Book locations: Chapter 18, Chapter 18A

https://elevatorworld.com/article/traffic-analysis-based-on-the-up-peak-round-trip-time-method-why-it-works-and-how-it-can-be-improved/

[28] The Evolution of Elevator Technology

Access: Fetched page/document text; relevant passages checked.

Use: Destination dispatch groups passengers by intended destination; evolution of Schindler technology.

Book locations: Chapter 18

https://www.schindler.com/content/dam/website/us/docs/media/reprint/fmj-evolution-destination-technology.pdf/_jcr_content/renditions/original./fmj-evolution-destination-technology.pdf

[29] Mitsubishi Electric Achieves Three GUINNESS WORLD RECORDS Titles for Fastest and Tallest Elevators

Access: Fetched page/document text; relevant passages checked.

Use: Mitsubishi's December 2016 announcement of three Guinness titles at Shanghai Tower.

Book locations: Chapter 14A, Chapter 19

https://mitsubishielevator.com/uploads/files/pdf/2016-12-09_MELCO-Guinness.pdf

[30] Hitachi's Elevator Delivered to Guangzhou CTF Finance Centre, a Skyscraper Complex Building in China, Received a GUINNESS WORLD RECORDS™ title as the World's Fastest : Hitachi Global

Access: Fetched page/document text; relevant passages checked.

Use: Hitachi's 2019 announcement: 1,260 m/min (21 m/s), about 42 seconds over 440 m, hotel lobby on floor 95.

Book locations: Chapter 19

https://www.hitachi.com/en/press/articles/2019/09/0927/

[31] 2013-06-10 New KONE UltraRope(TM) elevator hoisting technology enables the next big leap in high-rise building design - KONE GB

Access: Fetched page/document text; relevant passages checked.

Use: KONE's 2013 discussion of conventional steel-rope constraints. Approximate practical limits depend on design.

Book locations: Chapter 20

https://www.kone.co.uk/stories-and-references/press-releases/new-kone-ultrarope-tm--elevator-hoisting-technology-enables-the-next-big-leap-in-high-rise-building-design-2013-06-10.aspx

[32] 2013-06-10 New KONE UltraRope(TM) elevator hoisting technology enables the next big leap in high-rise building design - KONE GB

Access: Fetched page/document text; relevant passages checked.

Use: KONE's carbon-fibre UltraRope launch and claimed capability for travel up to 1,000 m; capability is not proof of an installed kilometre run.

Book locations: Chapter 20

https://www.kone.co.uk/stories-and-references/press-releases/new-kone-ultrarope-tm--elevator-hoisting-technology-enables-the-next-big-leap-in-high-rise-building-design-2013-06-10.aspx

[33] Otis separation and NYSE trading announcement, April 2020

Access: Fetched page/document text; relevant passages checked.

Use: Otis's April 2020 separation and independent public-company status.

Book locations: Chapter 21

https://www.sec.gov/Archives/edgar/data/1781335/000114036120007885/nc10010458x4_ex99-1.htm

[34] OTIS - OTIS REPORTS FOURTH QUARTER AND FULL YEAR 2024 RESULTS

Access: Fetched page/document text; relevant passages checked.

Use: Otis FY2024: net sales US$14,261m; service US$8,894m; new equipment US$5,367m; distinct segment operating profits. Maintenance portfolio approximately 2.4 million units at year end.

Book locations: Chapter 21, Chapter 25

https://otisinvestors.com/news/news-details/2025/OTIS-REPORTS-FOURTH-QUARTER-AND-FULL-YEAR-2024-RESULTS/default.aspx

[36] History

Access: Fetched page/document text; relevant passages checked.

Use: KONE history: Helsinki machine-shop origins in 1910, first self-produced elevator components installed in 1918, and stable ownership by four generations of the Herlin family.

Book locations: Chapter 22

https://www.kone.com/global/en/company/history.html

[37] Making room for more since 1996

Access: Fetched page/document text; relevant passages checked.

Use: KONE dates MonoSpace and its machine-room-less design to 1996.

Book locations: Chapter 22, Chapter 24A

https://www.kone.com/global/en/newsroom/stories/making-room-for-more-since-1996.html

[38] KONE Annual General Meeting 2025: CEO's Review

Access: Fetched page/document text; relevant passages checked.

Use: KONE's 2025 AGM review: market estimate over EUR80bn; China approximately 450k new units and rest of world approximately 400k. Source definitions and period govern these estimates.

Book locations: Chapter 22, Chapter 23

https://www.kone.com/en/Images/AGM%202025%20CEO%27s%20Review_tcm17-134801.pdf

[39] Schindler corporate history

Access: Fetched page/document text; relevant passages checked.

Use: Schindler founded in Lucerne in 1874 by Robert Schindler and Eduard Villiger.

Book locations: Chapter 22

https://group.schindler.com/en/company/history.html

[40] Schindler | Annual Report Financial Statements (2024, English)

Access: Fetched page/document text; relevant passages checked.

Use: Schindler FY2024 revenue CHF11,236m; cost-of-materials line in the financial statements.

Book locations: Chapter 22, Chapter 33

https://group.schindler.com/content/dam/website/group/docs/investors/2024/2024-schindler-fy-financial-statements-en.pdf

[41] Cinven: Acquisition completion

Access: Fetched page/document text; relevant passages checked.

Use: Advent and Cinven completed the acquisition of Thyssenkrupp's elevator business in July 2020.

Book locations: Chapter 22

https://www.cinven.com/news-insights/advent-international-and-cinven-complete-acquisition-of-thyssenkrupps-elevator-technology-business/

[42] TK Elevator reports record financial results for FY 2023/2024 with €9.3 billion sales and €1.5 billion adjusted EBITDA

Access: Fetched page/document text; relevant passages checked.

Use: TK Elevator FY2023/24 sales EUR9.3bn. Does not establish the specifications of TWIN.

Book locations: Chapter 22

https://www.tkelevator.com/global-en/newsroom/press-releases/tk-elevator-reports-record-financial-results-for-fy-2023-2024-with-%E2%82%AC9-3-billion-sales-and-%E2%82%AC1-5-billion-adjusted-ebitda-178624.html

[43] A Look at the World - Part 4. The Giant of the Global Elevator Industry

Access: Fetched page/document text; relevant passages checked.

Use: Secondary trade account of China's installed base and share. Units include lifts/escalators; not a building-lift-only census.

Book locations: Chapter 23, Chapter 23A

https://tapchithangmay.vn/en/a-look-at-the-world-part-4-the-giant-of-the-global-elevator-industry-p18439.html

[44] Elevator Market Outlook 2030 | Roland Berger

Access: Fetched page/document text; relevant passages checked.

Use: Roland Berger market outlook: US$107bn estimate, China's construction slowdown and the role of modernisation/service.

Book locations: Chapter 23, Chapter 23A, Chapter 33

https://www.rolandberger.com/en/Insights/Publications/Elevator-market-outlook-2030.html

[45] India’s Elevators and Escalators Market Growth | IBEF

Access: Fetched page/document text; relevant passages checked.

Use: IBEF's account of India's new-equipment market. Survey estimates and dates are not universal sales counts.

Book locations: Chapter 23

https://www.ibef.org/research/case-study/india-s-elevators-and-escalators-market-driven-by-urban-vertical-growth

[46] In Conversation: Judy Marks, Chair, President & CEO, Otis Worldwide Corporation

Access: Fetched page/document text; relevant passages checked.

Use: Otis CEO interview discusses the company's 1892 installation in Kolkata.

Book locations: Chapter 23

https://www.fortuneindia.com/long-reads/in-conversation-judy-marks-chair-president-ceo-otis-worldwide-corporation/118621

[47] Wittur landing door catalogue

Access: Fetched page/document text; relevant passages checked.

Use: Wittur catalogue includes Sematic landing-door products and applications.

Book locations: Chapter 24

https://www.wittur.com/en/elevator-components/landing-doors.aspx

[48] Otis ONE™ Connected Elevator Service | Otis USA

Access: Fetched page/document text; relevant passages checked.

Use: Otis ONE connected-service features. Predictive maintenance is an aim, not a guarantee against failure.

Book locations: Chapter 25, Chapter 36

https://www.otis.com/en/us/products-services/otis-signature-service/otis-one

[49] Heavy Lifting: The History of the Elevator Code - ASME

Access: Fetched page/document text; relevant passages checked.

Use: ASME's history of its elevator code and the first national code in 1921.

Book locations: Chapter 11A, Chapter 26, Chapter 26A

https://www.asme.org/topics-resources/content/heavy-lifting-the-history-of-the-elevator-code

[51] The American Safety Code for Elevators and Escalators ...

Access: Fetched page/document text; relevant passages checked.

Use: History of the early American safety code and its development into a standards process.

Book locations: Chapter 26

https://elevatorworld.com/article/the-american-safety-code-for-elevators-and-escalators-part-1/

[53] 75 Years, 75 Floors - Elevator World

Access: Fetched page/document text; relevant passages checked.

Use: Elevator World's 1945 crash retrospective: governor and hoist ropes damaged, Oliver's survival and reported cushioning factors. Not successful actuation of the normal safety chain.

Book locations: Chapter 27, Chapter 28

https://elevatorworld.com/article/75-years-75-floors/

[57] Shaft sinking

Access: Fetched page/document text; relevant passages checked.

Use: Reference account of the South Deep single-lift shaft, approximately 2,991 m; mine-hoist duty differs from building lifts.

Book locations: Chapter 30

https://en.wikipedia.org/wiki/Shaft_sinking

[58] How the Escalator Forever Changed Our Sense of Space

Access: Fetched page/document text; relevant passages checked.

Use: Reno, Seeberger and the development of the escalator; historical retail and public-space context.

Book locations: Chapter 31

https://www.smithsonianmag.com/innovation/how-escalator-forever-changed-our-sense-space-180972468/

[59] Paternoster lift

Access: Fetched page/document text; relevant passages checked.

Use: Paternoster operating principle and surviving installations. Restrictions vary by country and date.

Book locations: Chapter 31

https://en.wikipedia.org/wiki/Paternoster_lift

[60] 2010 ADA Standards, section 407: Elevators

Access: Fetched page/document text; relevant passages checked.

Use: ADA 2010 section 407: elevator controls, audible/visible indicators and related accessibility provisions.

Book locations: Chapter 32

https://www.corada.com/documents/2010ADAStandards/407

[61] Elevator Market Outlook 2030 | Roland Berger

Access: Fetched page/document text; relevant passages checked.

Use: Market outlook's discussion of service/modernisation and industry constraints; no universal installer training duration.

Book locations: Chapter 33, Chapter 33A

https://www.rolandberger.com/en/Insights/Publications/Elevator-market-outlook-2030.html

[62] NIST: Publications on elevators during fires

Access: Fetched page/document text; relevant passages checked.

Use: NIST research catalogue on elevator use during fires. Ordinary lifts are not automatically suitable evacuation systems.

Book locations: Chapter 14, Chapter 34

https://www.nist.gov/world-trade-center-investigation/publications-and-reports

[63] MULTI - A new era of mobility

Access: Fetched page/document text; relevant passages checked.

Use: TK's MULTI concept: rope-free vertical and horizontal movement, multiple cabins in a circulation system.

Book locations: Chapter 35

https://www.tkelevator.com/global-en/products/innovations/multi/

[64] The test tower

Access: Fetched page/document text; relevant passages checked.

Use: TK's Rottweil test tower: 246 m, 12 test shafts; engineering testing context.

Book locations: Chapter 24B, Chapter 35

https://testturm.tkelevator.com/global-en/the-test-tower/

[65] Study Report on Application of Lift Regenerative Power

Access: Fetched page/document text; relevant passages checked.

Use: Regenerative-drive operation and energy returned under suitable load/direction conditions. Savings depend on duty and equipment.

Book locations: Chapter 36

https://www.emsd.gov.hk/filemanager/en/content_764/applctn_lift_rgnrt_pwr.pdf

[66] Space Elevator History | ISEC.

Access: Fetched page/document text; relevant passages checked.

Use: Space-elevator concept history, including Tsiolkovsky and Artsutanov.

Book locations: Chapter 37

https://www.isec.org/history

[67] People Are Still Trying to Build a Space Elevator

Access: Fetched page/document text; relevant passages checked.

Use: Space-elevator proposals and material-strength limitations; Clarke's popularisation.

Book locations: Chapter 37

https://www.smithsonianmag.com/innovation/people-are-still-trying-build-space-elevator-180957877/

[68] The Space Elevator Construction Concept

Access: Fetched page/document text; relevant passages checked.

Use: Obayashi's space-elevator construction concept and stated 2050 ambition, not a delivered system or guaranteed schedule.

Book locations: Chapter 37

https://www.obayashi.co.jp/en/thinking/detail/space_elevator.html

[69] Elevator Market Outlook 2030 | Roland Berger

Access: Fetched page/document text; relevant passages checked.

Use: Roland Berger's US$107bn market estimate; a dated estimate with its own scope.

Book locations: Epilogue

https://www.rolandberger.com/en/Insights/Publications/Elevator-market-outlook-2030.html

[70] Otis Gen2 one-million sales milestone, December 2020

Access: Fetched page/document text; relevant passages checked.

Use: Otis: Gen2 launched in 2000; steel-reinforced polyurethane belts; one million sales milestone announced December 2020.

Book locations: Chapter 24A

https://www.prnewswire.com/news-releases/otis-celebrates-bestselling-gen2-elevator--over-1-million-units-sold-301189416.html

[71] Mitsubishi Electric: Earthquake measures (Japanese technical catalogue)

Access: Fetched page/document text; relevant passages checked.

Use: Mitsubishi's Japanese technical catalogue: earthquake sensing including P-wave operation and nearest-floor response.

Book locations: Chapter 19A

https://www.mitsubishielectric.co.jp/elevator/catalog/pdf/c-c01-8-c7857.pdf

[72] Buffalo Toronto Public Media: Dart, Dunbar and the colossus in the harbor

Access: Fetched page/document text; relevant passages checked.

Use: Buffalo grain-elevator development by Dart and Dunbar in the early 1840s; the public-media account dates the first operation to 1843.

Book locations: Chapter 4A

https://www.btpm.org/heritage-moments/2017-11-20/heritage-moments-dart-dunbar-and-the-colossus-in-the-harbor

[73] History of the Peak Tram

Access: Fetched page/document text; relevant passages checked.

Use: Peak Tram history: Hong Kong opening in 1888; funicular context.

Book locations: Chapter 31A

https://www.thepeak.com.hk/en/heritage/history-of-the-peak-tram

[74] Elevator World: Door operation upgrades

Access: Fetched page/document text; relevant passages checked.

Use: Elevator World upgrade article reports approximately 200,000 annual door cycles and over 70% trouble calls associated with worn door components. These are trade-article figures, not universal constants.

Book locations: Chapter 20A, Chapter 24B, Chapter 25A

https://elevatorworld.com/article/keep-your-elevators-running-with-door-operation-upgrades/

[75] KONE: The underground epicenter of elevator testing

Access: Fetched page/document text; relevant passages checked.

Use: KONE Tytyri: shafts as deep as 350 m, high-speed and free-fall testing; no kilometre-long single underground run.

Book locations: Chapter 24B

https://www.kone.com/global/en/newsroom/stories/testing-elevators-underground-and-remotely.html

[76] The Skyscraper Center: Otis Research Center

Access: Fetched page/document text; relevant passages checked.

Use: Skyscraper Center: Otis Research Center, Bristol, architectural height 116.7 m.

Book locations: Chapter 24B

https://www.skyscrapercenter.com/building/otis-research-center/12189

[77] Maintenance Control Programs for owners and managers

Access: Fetched page/document text; relevant passages checked.

Use: Maintenance-control programme requirements, task records and categories of pit, shaft, car, machine-room and hall equipment.

Book locations: Chapter 20A, Chapter 25A, Chapter 33A

https://www.elevatorinfo.org/elevator-maintenance-control-programs-mcp-building-owners-managers/

[78] S&P Dow Jones Indices: Otis index addition, March 2020

Access: Fetched page/document text; relevant passages checked.

Use: S&P classified Otis in Industrial Machinery at the 2020 spin-off index addition.

Book locations: Chapter 37A

https://press.spglobal.com/2020-03-31-Otis-Worldwide-and-Carrier-Global-Set-to-Join-S-P-500-American-Tower-to-Join-S-P-100-and-Macys-to-Join-S-P-SmallCap-600

[79] MSCI: Current GICS methodology

Access: Fetched page/document text; relevant passages checked.

Use: Current MSCI GICS structure: 20106020 Industrial Machinery & Supplies & Components.

Book locations: Chapter 37A

https://www.msci.com/index/methodology/latest/GICS