

00 How to Use This Guide

A site survey is where the proposal meets the building. This guide gives sales and engineering one playbook: what to ask before the visit, what to measure and photograph on site, how to hand off findings, and the formulas and code references behind it all.

SALES · ACCOUNT & PRESALES

Own the relationship, discovery and commercial scope. Start with **Part 2**, then **Section 20** (red flags, scope guardrails).

ENGINEERING · DESIGN & FIELD

Own the technical truth. Work from **Part 3** on site, **Part 5** for the math, **Part 6** forms on the clipboard.

PROJECT MANAGEMENT

Use **Sections 17–19** for logistics, responsibilities and handoff; **Forms B–D** for pre-install checks.

Guide map

PART · WHEN	WHAT'S INSIDE
1 · Foundations · once	Why surveys matter, survey types, the AVIXA project process, roles (RACI), the standards you will reference.
2 · Before the Visit · 1–2 wks out	Sales discovery script, stakeholder map, readiness gate, documents to request, logistics, survey kit.
3 · On Site · survey day	Workflow, then each discipline: architecture, displays, audio, VTC, control, power, network, pathways, structure, existing systems, safety, photos.
4 · After the Visit · ≤ 48 h	Report contents, "by others" responsibility matrix, handoff, red flags and scope-creep guardrails.
5 · Quick Reference	DISCAS, projection, camera, audio, power, thermal and pathway formulas; signal-reach, PoE, acoustic, lighting, ADA and RF tables.
6 · Field Forms · print	Forms A–G: site, room (two pages with sketch grid), equipment room, network/IT, inventory, large venue, closeout.

Legend

SALES	Sales leads this item
ENGINEER	Engineering leads this item
BOTH	Joint responsibility
STANDARD	AVIXA / ANSI / TIA reference
CODE	Enforceable code or law (NEC, ADA, OSHA)

Data - source codes

Write one next to every number you record.

M	Measured on site by the surveyor
D	Taken from drawings (note sheet and revision)
C	Customer-stated, not verified
E	Estimated; must be verified before design is final

Abbreviations

AFF	Above finished floor	FV / CV	Farthest / closest viewer distance	RCP	Reflected ceiling plan
AHJ	Authority having jurisdiction	IH · %EH	Image height · element height as % of IH	RFI	Request for information
ACT	Acoustic ceiling tile (lay-in grid)	IDF/MDF	Intermediate / main distribution frame	OFE/OFCI	Owner-furnished (contractor-installed) equip.
ALS	Assistive listening system	NC · RT60	Noise criteria · reverberation time	VTC · UC	Video conferencing · unified communications
BDM/ADM	Basic / Analytical Decision Making	PT sLab	Post-tensioned concrete slab	SOW · BOM	Statement of work · bill of materials

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Foundations

Why the survey matters, the four survey types, who does what, and the standards behind every measurement.

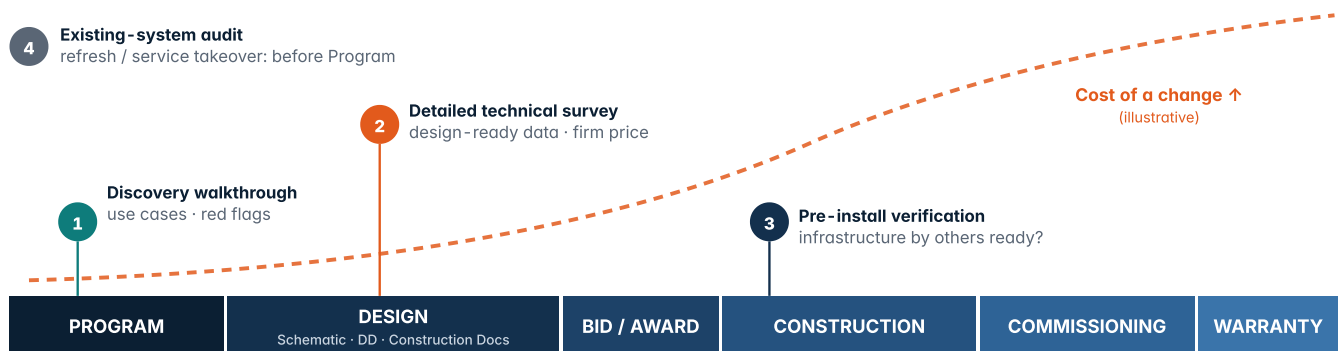
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01 Why the Site Survey Matters

BOTH

Every line in a proposal is a promise about a real room. The survey checks that each promise can be built, powered, connected, mounted and used as intended, and it finds the problems early, while they are still cheap to fix.

AVIXA's process guidance (ANSI/INFOCOMM 2M-2010, *Standard Guide for Audiovisual Systems Design and Coordination Processes*, and AVIXA's *Audiovisual Best Practices*) puts needs analysis and the review of existing facilities in the **Program phase**, before design. That is where space, structure, power, HVAC, lighting, acoustics and pathways can still change at little cost. After walls close and ceilings go in, the same changes become change orders, schedule slips and margin loss.



Phases per AVIXA Audiovisual Best Practices / ANSI/INFOCOMM 2M-2010. Touchpoints show where each survey type adds the most value.

Figure 1.1 · Where site surveys fit in the AV project life cycle

What a good survey produces

- 01 Verified conditions.** Dimensions, construction, power, network and environment the design can rely on.
- 02 Infrastructure requirements for others.** Circuits, backing, conduit, data drops, core drills and millwork that electrical, GC, IT and furniture trades must provide.
- 03 A priced risk list.** Assumptions, exclusions and contingencies, written down before the price is set.
- 04 Labor-plan inputs.** Access hours, lifts, delivery path, staging and site rules that drive install hours.
- 05 Customer alignment.** Stakeholders see their needs captured and confirmed, which builds trust and shortens the sales cycle.
- 06 A baseline for verification.** Ambient light, noise and pre-existing conditions recorded *before* you touch anything.

The cost of a miss

MISSSED AT SURVEY	WHAT HAPPENS AT INSTALL
Metal studs with no backing	Display cannot be safely mounted. Wall opened, backing added, drywall patched and painted. Change order plus a return trip.
Hard-lid ceiling, no access	No cable path. Access panels or surface raceway needed, with aesthetic approvals and patching.

MISSED AT SURVEY	WHAT HAPPENS AT INSTALL
Post-tensioned slab	Floor-box cores cannot be drilled without scanning and structural approval. Redesign of table connectivity.
West-facing glass behind display wall	Washed-out image all afternoon. Shades, a brighter display or a re-layout after the fact.
HVAC diffuser above ceiling mic	Air noise picked up and sent to the far end. Mic relocation, ceiling rework, retuning.
IT not engaged; no ports or VLAN	System installed but cannot go live. Security review starts at the end, and go-live slips by weeks.
Delivery path not measured	98-inch display does not fit the elevator or stair turn. Rigging, a crane or a smaller display.
High reverberation (glass, hard floors)	Echo and poor far-end audio no matter which equipment is used. Acoustic treatment added late.
Fire-alarm interface not identified	Program audio does not mute on alarm. Failed inspection and delayed occupancy.

Survey types

TYPE	WHEN	WHO	DEPTH	OUTPUT
1 • Discovery walkthrough	Early sales, pre-proposal	Sales, plus an engineer for complex sites	Use cases, rough dimensions, context photos, red flags, stakeholder map	Budgetary estimate; scope for the detailed survey
2 • Detailed technical survey	Before final design or a firm quote	Engineer + Sales	Full measurements and infrastructure assessment, all forms, readings, every room	Design-ready survey report; firm proposal and SOW
3 • Pre-install verification	After award, before mobilization and at construction milestones	Project engineer or lead tech + PM	Confirms infrastructure by others is complete and matches the design; field-verifies dimensions	Ready-for-install sign-off; punch list for other trades
4 • Existing-system audit	Refresh projects; service takeover	Engineer or service lead	Inventory, condition, firmware, signal flow, documentation, code ownership	Reuse / relocate / retire matrix; migration plan

02 Roles & Responsibilities

BOTH

Sales owns the relationship and the commercial scope. Engineering owns the technical truth. On anything beyond a single small room, send both: the best surveys happen when the salesperson keeps stakeholders engaged while the engineer measures.

TASK	SALES	ENGINEER	PM
Pre-survey discovery: goals, use cases, budget, timeline, decision process	R/A	C	—
Schedule survey; confirm access, escorts, attendees, site rules, COI	R/A	C	I
Define which drawings and documents to request; request them	R	A	I
Lead the on-site kickoff and introductions	R/A	C	—
Capture user needs and pain points in each room	R	R	—
Measurements, readings, infrastructure assessment, forms	C	R/A	—
Photo and video documentation	C	R/A	—
Identify technical risks and red flags	C	R/A	I
Identify commercial risks: budget, decision, competition, timeline	R/A	C	—
Closeout meeting: findings, RFIs, next steps	R/A	R	—
Survey report	C	R/A	I
Proposal, SOW, assumptions and exclusions	R/A	C	C
Handoff to project team after award	R	R	A
Pre-install verification survey	I	R	A

R Responsible (does the work) · A Accountable (owns the result) · C Consulted · I Informed

SALES ON SITE: DO

- Keep stakeholders moving and engaged so the engineer can measure.
- Write down every feature request verbatim, tagged by room.
- Ask "what happens if...?" to surface priorities and budget limits.
- Confirm who approves, by when, and what they need to see.
- Set expectations for the report date and next steps.

SALES ON SITE: DON'T

- Promise models, prices or features before engineering review.
- Say "that's easy" about anything inside a wall or ceiling.
- Agree to scope that belongs to other trades.

ENGINEER ON SITE: DO

- Verify every assumption: wall, ceiling, power, network.
- Record the source of every number (M / D / C / E).
- Photograph before touching anything, including existing damage.
- Flag risks out loud at closeout; never bury them in the report.
- Finish Form B before leaving each room.

ENGINEER ON SITE: DON'T

- Design or price on the spot in front of the customer.
- Disturb suspect materials, fire-alarm devices or live electrical.
- Rely on drawings alone; field conditions win.

03 Standards & References at a Glance

ENGINEER

You won't quote standards to customers on site, but your measurements have to support them. This table shows which documents shape what you capture.

ABOUT THE STANDARDS CITED IN THIS GUIDE

A summary of public guidance from AVIXA, ANSI, TIA, NFPA, DOJ/Access Board, OSHA, the FCC and manufacturers; it does not replace the documents, so buy current editions for design work. The display - sizing standard was reissued as **ANSI/AVIXA V202.01:2026**; the DISCAS formulas here come from the 2016 edition and AVIXA training material, so confirm with AVIXA's online DISCAS calculator. For codes, the AHJ's adopted edition governs.

AVIXA / ANSI AUDIOVISUAL STANDARDS

STANDARD	GOVERNS	WHY IT MATTERS AT THE SURVEY
ANSI/AVIXA V202.01:2026 (was ANSI/INFOCOMM V202.01:2016; "DISCAS")	Display image size and viewing positions for 2D content	Capture farthest/closest viewer distances, eye height, display - wall height and lateral seats so image size can be verified.
AVIXA V201.01:2021	Image system contrast ratio, measured in the room	Measure ambient light on the display surface under real lighting and daylight.
ANSI/AVIXA A102.01:2022	Audio coverage uniformity across listener areas	Map listener areas, ceiling heights and obstructions that drive loudspeaker layout.
AVIXA A103.01:2023 · A104.01	Spectral balance · dynamic range (SPL and SNR in listener areas)	Record background noise now; it sets the SPL the system must achieve and is the baseline for verification.
ANSI/AVIXA F502.02:2020 (R2023)	Rack design: selection, thermal, power, earthing/bonding, design inputs	Rack location, ventilation, power, bonding and how site cabling enters the rack.
AVIXA F501.01:2015	Cable labeling for AV systems	Note the owner's existing labeling scheme so new work matches it.
ANSI/AVIXA D401.01:2023	Documentation requirements for AV systems	Your survey report is project documentation; structure it to feed the D401 deliverables.
ANSI/AVIXA D402.02 (was ANSI/INFOCOMM 10:2013)	AV systems performance verification	Verification checks the system against what the survey recorded, so capture baselines and pre-existing conditions.
AVIXA S601.01:2021	Energy management for AV systems	Ask about power scheduling, metering and sustainability goals.
AVIXA RP-C303.01:2018	Recommended practices for security in networked AV	Drives IT and security discovery (Section 13, Form D).
ANSI/INFOCOMM 2M-2010	AV design and coordination processes: tasks, who does them, who signs off	Defines the Program-phase needs analysis and existing-conditions review the survey supports.
AVIXA TR-111:2019	Unified automation for buildings	Lighting, shade, HVAC and BMS integration points.

CODES, CABLING, ACCESSIBILITY AND OTHER REFERENCES

REFERENCE	GOVERNS	WHY IT MATTERS AT THE SURVEY
NFPA 70 (NEC) CODE	Electrical and power-limited / communications cabling	Plenum ratings, cable support (not from ceiling grid), firestopping, circuit capacity, working space.

REFERENCE	GOVERNS	WHY IT MATTERS AT THE SURVEY
NFPA 72 CODE	Fire alarm and emergency communications	AHJs commonly require program audio to mute on alarm. Locate the FACP or relay point.
2010 ADA Standards CODE	Assistive listening (219, 706), reach (308), protruding objects (307), operable parts (309)	Assembly-area ALS counts, touch-panel heights, displays in circulation paths.
ANSI/TIA-568 · 569 · 606 · 607	Structured cabling · pathways and spaces · labeling · bonding	100 m channel, conduit bends and pull points, labeling, telecom grounding.
BICSI TDMM; BICSI AV design references	ICT and AV infrastructure design practice	Pathway and space planning, IDF/MDF requirements.
ANSI/ASA S12.60	Classroom acoustics	Background noise and reverberation limits for learning spaces.
ASHRAE Handbook, HVAC Applications (Noise & Vibration)	Recommended background-noise criteria by space type	NC/RC targets for conference, teleconference and assembly spaces.
UL 2442 · UL 62368-1	Wall and ceiling mounts · AV/ICT equipment safety	Use listed mounts and equipment and record weights and substrates.
OSHA 29 CFR 1926 LAW	Construction safety, including ladders (1926.1053) and asbestos (1926.1101)	Ladder use, presumed asbestos in pre-1981 buildings.
FCC rules (Parts 15 and 74)	Wireless microphone spectrum	RF scan; the 600 MHz service band is off-limits.
Platform room guides	Microsoft Teams Rooms, Zoom Rooms, Google Meet, Webex certified hardware and room guidance	Confirm the platform and licensing, and follow vendor network and room guides.

PART 02

Before the Visit

Discovery that makes the visit count: the sales script, stakeholder map, readiness gate, documents, logistics and the survey kit.

04 Sales Discovery Script

05 Pre - Visit Preparation

04 Sales Discovery Script

SALES

Do discovery **before** the survey, on a 30–45 minute call, so the site visit confirms what you learned instead of starting from scratch. Ask open questions, listen for constraints, and record answers on Form A.

HOW TO RUN IT

Pick the blocks that fit the opportunity; you won't need every question. Open with business context (A), go deep on use cases (B), and leave budget and decision process (F–G) for after you have built some credibility. Repeat key answers back in the customer's words. Each "**Listen for**" line shows what the answer means for the survey.

A · BUSINESS CONTEXT & GOALS

1. What prompted this project now: new build, renovation, refresh, hybrid-work policy, failures?
2. Six months after go-live, what does success look like? How will you measure it?
3. What happens if this project slips or doesn't happen?
4. Do you have AV, IT or cabling standards we must follow? Can we have a copy?

Listen for: the business outcome, urgency, the owner's standards (which change design and product choices), and success metrics you can design to.

B · USERS & USE CASES

1. Who uses these spaces, and how comfortable are they with technology?
2. Typical and maximum attendance per space?
3. Walk me through a typical meeting, class or event, from walk-in to walk-out.
4. Which sessions include remote participants? On which platforms: Teams, Zoom, Google Meet, Webex? Room system, BYOD, or both?
5. What content is shown: slides, video, detailed spreadsheets, CAD, medical images?
6. Any recording, streaming, lecture capture, overflow or interpretation needs?
7. Any users with hearing, vision or mobility needs?

Listen for: seat counts (drive DISCAS and mic/speaker counts), detailed content (ADM sizing means bigger images), platform (certified devices, licensing), and ALS obligations.

C · CURRENT STATE & PAIN POINTS

1. What works today that we must not break?
2. What do users complain about most? What do help-desk tickets say?
3. What existing equipment should be reused? How old is it? Owned or leased? Under a service contract?
4. Who supports the rooms today, internally or through a provider?

Listen for: audio complaints (often acoustics, not equipment), reuse expectations to verify on site, and support models that shape monitoring and service proposals.

D · SPACES, CONSTRUCTION & SCOPE

1. Which rooms and areas are in scope? Room types, quantities, floors, buildings?
2. Is construction or renovation intended? Who are the architect, GC and electrical contractor?
3. When will walls and ceilings be open? When is occupancy?
4. Owned or leased building? Will the landlord need to approve work?
5. Is furniture changing? Who is the furniture vendor?

Listen for: chances to put backing, conduit and boxes in walls before close-up, plus landlord rules, coordination partners and schedule pressure.

E · IT, NETWORK & SECURITY

1. Who is the IT contact, and can they join the survey?
2. Who owns the network: owner, landlord or MSP? Is there a VLAN or security policy for AV/IoT devices?
3. Are cloud-managed devices allowed? What security reviews or approved-vendor lists apply?
4. Any procurement restrictions, such as NDAA §889 for federally funded work or TAA?
5. Who owns calendar resource accounts and platform licenses?

Listen for: security-review lead times (often the critical path), switch ownership, and product restrictions that change the bill of materials.

F · BUDGET, FUNDING & PROCUREMENT

1. Is budget approved? What range are you working within?
2. Capital purchase or operating/as-a-service? What is the funding source: operating, capital, grant, bond?
3. Are there fiscal-year or grant deadlines?
4. Procurement path: direct, RFP, cooperative contract, GSA? Any prevailing-wage, bonding, insurance or diversity requirements?

Listen for: a budget/scope mismatch (propose phasing), paperwork lead times, and labor-rate implications.

G · DECISION PROCESS & TIMELINE

1. Who makes the final decision? Who else influences it?
2. What are the steps and dates to a signed PO? Are other integrators involved?
3. What is the required go-live date, and why? Any blackout dates, such as exams, events or fiscal close?

Listen for: a hard deadline versus a preferred one, compared with equipment lead times and construction milestones.

H · SUPPORT & LIFECYCLE

1. What warranty, response time and uptime do you expect?
2. Interested in remote monitoring or managed services?
3. Who needs training: end users, help desk, admins?
4. What is your refresh cycle?

Listen for: recurring-revenue opportunities and design requirements such as monitoring access and spare parts.

Stakeholder map

STAKEHOLDER	WHAT THEY CARE ABOUT	AT THE SURVEY?
Executive sponsor / economic buyer	Outcomes, cost, risk, timeline	Kickoff and closeout
End-user champion	Ease of use, reliability, "make it like the room that works"	Yes: walkthrough
IT / network / security	Security, standards, support load, network capacity	Essential
Facilities / building engineer	Access, power, structure, ceilings, HVAC, schedule	Essential
Architect / GC / electrical contractor	Coordination, sequencing, who provides what	On construction projects
Procurement	Compliance, contract vehicle, paperwork	No; follow up after
Security / compliance / legal	Cameras, recording, privacy, secure rooms	For sensitive spaces

SURVEY-READINESS GATE: DON'T BOOK THE DETAILED SURVEY UNTIL...

- | | |
|--|---|
| ☐ The decision maker and process are identified | ☐ Access to every room, ceiling and IDF is confirmed |
| ☐ A budget range or funding source is known | ☐ IT and facilities contacts are committed to attend |
| ☐ The room list and priorities are confirmed | ☐ Drawings and owner standards are requested |

For large or complex projects, consider a defined, paid design/survey engagement, credited to the project if awarded. It protects engineering time and shows the customer the value of the work.

05 Pre-Visit Preparation

BOTH

Survey day goes well when the documents, access and kit are ready ahead of time. Use this page as the checklist for the week before.

5.1 Documents to request

- ☐ Architectural floor plans (CAD preferred), reflected ceiling plans (RCP), interior elevations, furniture plans
- ☐ Electrical plans and panel schedules; mechanical (HVAC) plans
- ☐ Structural drawings: slab type (post-tensioned?), framing, deck
- ☐ Specification sections, if construction: Div 26 (electrical), 27 (communications), 28 (security)
- ☐ Owner AV, IT and cabling standards; network diagrams; VLAN/IP policy
- ☐ Existing AV as-builts, equipment lists, service history, control code location
- ☐ Life-safety plans showing fire-rated walls; asbestos survey (older buildings)
- ☐ Construction schedule; landlord work rules; site safety plan

5.2 Logistics to confirm

- ☐ Date, start time, expected duration (estimate below)
- ☐ Rooms unbooked during the survey; above-ceiling, IDF/MDF, electrical and roof access
- ☐ Escort, badging, parking, sign-in, site safety orientation
- ☐ Certificate of insurance (COI) sent; NDA if required
- ☐ Photography permitted? (Some sites restrict it; get it in writing.)
- ☐ Ladder or lift provided, or bring your own (follow site rules)
- ☐ PPE requirements (construction sites, healthcare, industrial)
- ☐ Attendees confirmed: IT, facilities, end-user champion

5.3 Time-on-site planning

SPACE	ALLOW
Huddle / small conference (≤ 6 seats)	20-30 min
Medium conference / training (8-20)	30-45 min
Boardroom / divisible room	45-75 min
Classroom / lecture room	30-60 min
Auditorium / worship / multipurpose	2-4 h
IDF/MDF or equipment room (each)	15-30 min
Kickoff + closeout meetings	30 min each

These are planning rules of thumb. Add time for escorts, locked rooms and above-ceiling inspection.

5.4 Prepare the paperwork

- ☐ Print the floor plans; label every room with its official room number
- ☐ Pre-fill Form A and one Form B per room; bring spares
- ☐ Pre-calculate DISCAS for the expected seat layouts (Part 5)
- ☐ Review previous proposals, tickets and as-builts for this site
- ☐ Create the shared project folder and photo-naming convention
- ☐ Share the agenda with the customer: kickoff, walkthrough, rooms, closeout

5.5 The survey kit

CATEGORY	ITEMS
Measure	Laser distance meter (Bluetooth logging helps) · 25 ft tape and 100 ft tape or wheel · digital level / inclinometer · stud finder with metal and live-AC detection
Light & sound	Illuminance meter (lux/ftc) · sound level meter, Class 1 or 2, with A-weighting and slow response (octave bands if available) · impulse source and RT60 app or meter
Electrical & network	Non-contact voltage tester · receptacle tester · network tester that reports link speed, PoE class/power, VLAN and switch/port via LLDP/CDP · tone and probe · cable certifier if reusing cabling
Imaging	Phone or tablet with LiDAR scan app · 360° camera · borescope / inspection camera · inspection mirror · headlamp and flashlight
Access	Ladder rated for the task (or site-provided) · gloves · ceiling-tile tool · drop cloth · painter's tape for temporary marks (with permission)
RF & wireless	Spectrum scanner or wireless-mic receiver with scan software · Wi-Fi analyzer app
Connectivity test	Laptop with HDMI, USB-C, DisplayPort adapters · test-pattern source · USB-C video adapter · known-good HDMI cable
Documentation	Printed plans · Forms A-G · clipboard · pencils and fine markers · label maker · spare batteries and power bank
PPE & admin	Safety glasses · hard hat and hi-vis (construction) · safety-toe boots · N95 for above-ceiling dust · ID / badge · COI copy · business cards · site contact list

On Site

The survey-day workflow, then every discipline you need to assess, measure, photograph and record before you leave the building.

- | | |
|----|---------------------------------------|
| 06 | The Survey-Day Workflow |
| 07 | Room Architecture & Measurements |
| 08 | Displays, Projection & Sightlines |
| 09 | Audio & Acoustics |
| 10 | Video Conferencing & Cameras |
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| 13 | Network & IT |
| 14 | Pathways & Infrastructure |
| 15 | Structural & Mounting |
| 16 | Existing Systems Audit |
| 17 | Logistics, Safety & Compliance |
| 18 | Photo & Documentation Standard |

06 The Survey-Day Workflow

BOTH

Run every survey in the same order. A fixed sequence means nothing gets skipped, the customer sees a professional process, and every report is organized the same way.



Figure 6.1 · The eight-step survey sequence

- 01 Arrive and check in.** Arrive early, badged, in the right PPE. Sign in, complete any safety orientation, confirm the escort, restricted areas and photo rules.
- 02 Kickoff (15–30 min).** Introductions and roles. Restate goals and scope from discovery. Confirm the room list, priorities and building changes. Ask: "Is there anything we should know? Leaks, past problems, upcoming moves?" Agree on the closeout time.
- 03 User walkthrough.** Have an end user show you how they use the room today. Write down pain points verbatim. Sales captures needs per room while the engineer observes room conditions.
- 04 Room-by-room survey.** In each room: (a) photograph per the photo standard (Section 18) *before* touching anything, including pre-existing damage; (b) measure and sketch; (c) assess each discipline (Sections 07–15); (d) inventory existing equipment (Section 16); (e) note risks; (f) **finish Form B before you leave the room.**
- 05 Infrastructure spaces.** IDF/MDF: rack space, free switch ports, PoE budget, patch-panel labels, cable distance to each room. Electrical: panel locations, spare breakers, photo of every panel schedule. Equipment rooms: cooling and access.
- 06 Delivery path and logistics.** Walk the path from loading dock through freight elevator and corridors to each room. Measure the smallest door, the elevator interior and any tight turns. Find staging, storage and debris-removal locations.
- 07 Closeout meeting.** Summarize what you found, early risks, items the customer must act on (RFIs), and the report date. **Don't design or price in the room.**
- 08 Report within 48 hours.** Upload photos and forms the same day to the shared project folder, with dates and version control. Send the recap email within 24 hours; the full report follows (Section 19).

AVIXA FIELD GUIDANCE

AVIXA's site-survey guidance stresses complete measurements (heights, diagonals, slopes, not just lengths), measuring actual lighting and ambient noise, confirming wall-mounting and drilling permissions, using checklists tailored to the project type, photos with scale references, revisiting complex sites, and to **"document more than you think is necessary."**

2+

Measure critical dimensions twice, with two methods if possible (laser plus tape).

3+

Photos of every critical condition: wide, medium, and close-up with a scale reference.

0

Assumptions left unlabeled. Every number gets a source code: M, D, C or E.

07 Room Architecture & Measurements

ENGINEER

Every later calculation (image size, speaker spacing, cable lengths, mount positions) depends on accurate dimensions and a clear picture of how the room is built.

CAPTURE	HOW	NOTES AND WHY IT MATTERS
Length and width	Laser, wall to wall at floor level	Measure both diagonals. If they differ, the room is out of square, which matters for video walls and millwork.
Ceiling height(s)	Laser to ceiling at several points	Record soffits, bulkheads, slopes and clouds separately. These drive projector, speaker and mic placement.
Deck / structure height	Lift a tile and measure plenum depth	Clearance for speaker back-cans, projector mounts, mic arrays and cable trays. Note ducts, pipes and trays in the way.
Ceiling type	Visual; lift tiles	ACT grid (2×2 / 2×4), hard lid (gypsum: access panels needed), open/exposed structure, specialty (wood, metal, baffles).
Plenum status	Ask facilities; look for open return grilles	A return-air plenum requires plenum-rated cable or raceway (Section 14).
Wall construction	Stud finder, knock test, look above ceiling, ask	Wood or metal stud (gauge? spacing 16" or 24" o.c.), CMU (hollow or grouted), concrete, brick, glass, demountable partition. Does the wall stop at the ceiling or run to deck?
Windows and glazing	Size, sill and head height, compass orientation	Glare and contrast on displays; backlighting in camera shots; window treatments and controls.
Doors	Location, swing, width, sidelites	Sightlines, control-panel and scheduling-panel locations, delivery clearance.
Obstructions	Locate on the plan with dimensions	Columns, beams, sprinklers, smoke detectors, light fixtures, diffusers, exit signs, thermostats.
Floor	Visual; ask; check drawings	Slab on grade, elevated slab (post-tensioned?), raised access floor. Floor boxes: size, location, contents, conduit.
Furniture	Measure; note model if known	Table size, shape, height and seat count; credenzas; movable or fixed; existing grommets and cubbies.
Existing devices	Distance from reference corner; height AFF	Receptacles, data plates, AV plates, wall boxes, thermostats, light switches: anything you could reuse or must avoid.

MEASUREMENT METHOD

- Set a **reference corner** (for example, "SW corner = 0,0"), draw a north arrow, and dimension clockwise.
- Record heights as **AFF** and state whether you measured to center, top or bottom.
- Sketch a plan, plus an elevation of every wall that will receive equipment (at least the display wall).
- LiDAR scans and 360° photos give context. Confirm critical dimensions with a laser.

COMMONLY MISSED

- Heights and diagonals (only lengths captured)
- Light fixtures and diffusers directly above the table or in the projection path
- Walls that stop at the ceiling (sound leaks over, but they offer a cable path)
- Glass walls and sidelites where you intend to mount panels
- Thermostats and switches right where the display goes

08 Displays, Projection & Sightlines

ENGINEER

V202.01 · V201.01

Size the image from the farthest viewer and the content they need to read, never from a diagonal that "feels right." Then check that the wall, the light and the structure can support it.

8.1 Size the image with DISCAS (ANSI/AVIXA V202.01)

Basic Decision Making (BDM). Viewers must read and understand the content without resolving every pixel: presentations, video, typical documents.

$$IH = FV \div (200 \times \%EH)$$

Analytical Decision Making (ADM). Viewers must resolve every detail, down to the pixel: dense spreadsheets, CAD, medical imaging, code.

$$IH = (FV \times \text{vertical resolution}) \div 3438$$

%EH is the height of the smallest element viewers must read, as a percentage of image height. Smaller elements mean a lower %EH and a larger required image.

Closest viewer (BDM). The angle from the closest viewer's eye to the top of the image is limited to 30° above eye level:

$$CV = (IH + IO) \times 1.732 \text{ where } IO = \text{bottom of image (AFF)} - \text{eye height}$$

Horizontal. No viewing position may exceed 60° to any part of the displayed image (BDM and ADM). Check the outer seats.

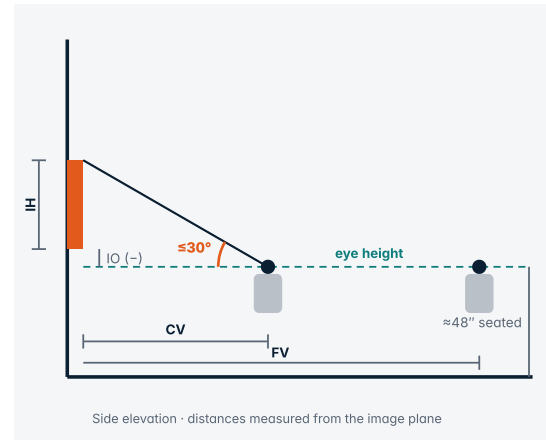


Figure 8.1 · DISCAS geometry: closest viewer limited by the 30° vertical angle; image height set by the farthest viewer

WORKED EXAMPLE (BDM)

Farthest viewer 22 ft (264 in), content %EH = 4%: $IH = 264 \div (200 \times 0.04) = 33.0$ in. A 16:9 image needs a diagonal $\geq 33.0 \div 0.490 = 67.3$ in, so specify a **75"** display ($IH \approx 36.8$ in). Check: max $FV = 36.8 \times 0.04 \times 200 = 294$ in (24.5 ft) ✓. Bottom of image at 40 in AFF, seated eye height 48 in, so $IO = -8$ in and $CV = (36.8 - 8) \times 1.732 = 49.9$ in (≈ 4.2 ft) ✓. If the content were denser (%EH = 3%), $IH = 44$ in, which calls for a 98" display or projection.

CAPTURE ON SITE FOR DISCAS

- ☐ Farthest viewer distance (display plane to the farthest eye)
- ☐ Closest viewer distance and lateral position of the outermost seats
- ☐ Seated eye height (≈ 48 in / 1.2 m typical); standing, if applicable
- ☐ Usable display - wall width and height, minus obstructions
- ☐ Lowest acceptable bottom-of-image (clears table, heads, credenza)
- ☐ Content type and smallest element (BDM vs. ADM; %EH)

8.2 Ambient light & contrast (AVIXA V201.01)

Image quality depends on **system contrast in the room**. V201.01 measures it in place with an ANSI 4×4 checkerboard, so ambient light on the display surface counts against you. Minimum contrast by viewing category:

MEASURE AND RECORD

- ☐ Illuminance (lux or fc) at the display or screen surface, meter facing into the room
- ☐ Every lighting scene: all on, presentation, video; blinds open and closed

VIEWING CATEGORY	MIN. CONTRAST
Passive viewing (signage, ambient TV)	7:1
Basic decision making (presentations)	15:1
Analytical decision making (detail, medical, art)	50:1
Full-motion video (cinema-style)	80:1

- ☐ Time of day and weather (sun moves; revisit for west/south glass)
- ☐ Fixture types and positions relative to the screen (downlights washing the screen)
- ☐ Lighting zones: can the front zone dim on its own? Who controls it?
- ☐ Window treatments: manual or motorized, and can they be integrated?

1 fc = 10.764 lux. Direct sun on a display wall usually means shades, a high-brightness display (often 700–2,500+ nits) or LED.

8.3 Mounting, placement & projection

FLAT PANELS & VIDEO WALLS

- **Structure behind every display:** stud type and spacing, need for backing (metal studs almost always need it), masonry type, or no wall at all (glass means floor stands or mullion mounts).
- **Weight:** display plus mount. Mounts listed to UL 2442 are load-tested to 4× rated load (≤ 100 lb) or 2× plus 200 lb (above 100 lb).
- **Recessed box** behind the display for power and AV so plugs don't protrude. Check wall depth and whether the wall is fire-rated (rated walls need rated boxes or putty pads).
- **Height:** bottom of image clears heads and table objects; top stays within the 30° closest-viewer limit; leave room for a camera above or below.
- **Video walls / LED:** wall flatness and load capacity, multiple circuits, heat, front- vs. rear-service clearance, pixel pitch vs. viewing distance (Part 5).

PROJECTION

- **Throw distance** = throw ratio × image width. Check the full beam path for fixtures, beams, diffusers, sprinklers and signs.
- **Structure** above the ceiling for the mount (deck, unistrut, joists), plus power and data at the projector.
- **Screen:** recessed-in-ceiling screens need ceiling coordination and an access panel; check the screen drop vs. door and window heads.
- **Short-throw** projectors for shallow rooms; note presenter shadowing and glare toward the audience.
- **Brightness:** see the AVIXA projector-lumens formula in Part 5. It needs measured ambient light and screen area.

ADA IN CIRCULATION PATHS

Objects with leading edges between **27" and 80"**

AFF may protrude no more than **4"** into a circulation path (2010 ADA 307.2). Displays in corridors and lobbies need recessing or a cane-detectable element below. Operable parts (touch and scheduling panels) go within the **15"–48" AFF** reach range (308).

09 Audio & Acoustics

ENGINEER

A102.01 · A104.01

In most rooms, acoustics limit audio quality more than equipment does. Measure the room's noise and reverberation before choosing a single microphone, and put treatment in the proposal when the room needs it.

9.1 Baseline the room

BACKGROUND NOISE

- Sound level meter, **A-weighted, slow response**, at several listener positions. HVAC in normal occupied mode, doors closed.
- Record dBA. If the meter does octave bands, capture them to estimate NC.
- Note intermittent sources: elevators, mechanical rooms, traffic, adjacent spaces, projector and PC fans, IDF closets, VAV boxes.

REVERBERATION & REFLECTIONS

- Estimate RT60 with an impulse (clapper or balloon) and an RT app or meter, or calculate it with Sabine (Part 5).
- Estimate the percentage of hard surfaces: glass, drywall, concrete, whiteboards, hard floors.
- Clap between parallel hard walls to check for flutter echo.

ISOLATION & PRIVACY

- Do walls run to the deck? Are doors gasketed? Any shared ducts or open plenum over walls?
- Privacy-sensitive rooms (boardroom, HR, legal) may need isolation or sound masking.

SPACE	TARGET	SOURCE
Conference / teleconference	NC 25-30	ASHRAE
Courtroom	NC 25-30	ASHRAE
Worship space	NC 25-30	ASHRAE
Drama theater	NC 20-25	ASHRAE
Private office	NC 30-35	ASHRAE
Open-plan office	NC 35-40	ASHRAE
Classroom: background	≤ 35 dBA	S12.60
Classroom < 10,000 ft ³ : RT60	≤ 0.6 s	S12.60
Classroom 10,000-20,000 ft ³ : RT60	≤ 0.7 s	S12.60

ASHRAE values are recommended design ranges for HVAC background sound (ASHRAE Handbook, HVAC Applications). ANSI/ASA S12.60 values are for unoccupied, furnished classrooms.

SALES ANGLE

If users complain about echo or "people can't hear us," it is usually a room problem. Quote acoustic treatment as its own line item and explain why. Don't let a microphone take the blame for the room.

9.2 Microphones

- Count seats and talker positions: table, lectern, presenter area, audience Q&A.
- **Ceiling arrays:** confirm ceiling height and type against the manufacturer's supported range. Keep them away from HVAC diffusers, projectors and loudspeakers. Check the mounting method (tile bridge, hard-lid, pendant).
- **Table mics:** table material and core-drill or grommet path; coverage per mic vs. seat layout.
- **Wireless mics:** run an RF scan. The 600 MHz service band (617-652 and 663-698 MHz) has been off-limits since July 13, 2020. Usable options include TV channels below 608 MHz, 902-928 MHz, 1920-1930 MHz, 2.4 GHz and licensed bands (Section 22). Plan charging locations.
- **Reinforcement:** for voice lift, record talker-to-mic, mic-to-loudspeaker and loudspeaker-to-listener distances for PAG/NAG (Part 5).

9.3 Loudspeakers

- Program audio only, or speech reinforcement as well? Distributed ceiling, wall-mounted or point-source arrays?
- **Ceiling speakers:** coverage diameter at ear height is $D = 2 \times (H - h) \times \tan(C/2)$, with $h \approx 48"$ seated. Spacing: edge-to-edge $2r$, minimum overlap $r\sqrt{2}$, center-to-center r .
- Check plenum depth for back-cans; fire-rated ceilings may need rated enclosures; tether per local rules.
- Large venues: rigging points (need structural engineering), front-of-house position, stage, sightlines to arrays, amplifier room and its heat.
- 70 V / 100 V distributed vs. low-impedance; amplifier sizing $W_t = W \times N \times 1.5$.

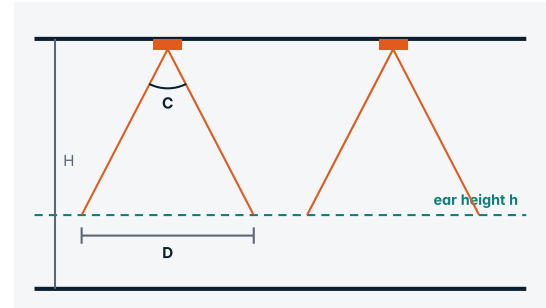


Figure 9.1 · Ceiling loudspeaker coverage at ear height

9.4 Assistive listening (2010 ADA Standards)

An ALS is required in each **assembly area** where audible communication is integral to the use of the space and audio amplification is provided. Courtrooms need one regardless. Entrances need signage with the International Symbol of Access for Hearing Loss (216.10).

Performance (706): 110–118 dB SPL output with a 50 dB dynamic range; SNR ≥ 18 dB; peak clipping ≤ 18 dB.

On the survey: seating capacity, a location for the transmitter or charging station, and floor construction if a hearing loop is being considered (metal in the floor reduces loop performance). IR systems struggle in sunlit rooms.

SEATING CAPACITY	MIN. RECEIVERS	HEARING-AID COMPATIBLE
≤ 50	2	2
51–200	2 + 1 per 25 seats over 50	2
201–500	2 + 1 per 25 seats over 50	1 per 4 receivers
501–1,000	20 + 1 per 33 seats over 500	1 per 4 receivers
1,001–2,000	35 + 1 per 50 seats over 1,000	1 per 4 receivers
2,001+	55 + 1 per 100 seats over 2,000	1 per 4 receivers

Table 219.3, 2010 ADA Standards (counts round up: "or fraction thereof"). Hearing-aid-compatible receivers use neckloops for telecoil access. Check state and local amendments.

10 Video Conferencing & Cameras

ENGINEER

SALES

Video rooms are the least forgiving spaces you will survey. The camera sees the light, the background and every seat; the microphones hear the HVAC and the reverberation; and the platform sets the hardware and network rules.

10.1 Platform & licensing

- ☐ Platform(s): Microsoft Teams Rooms, Zoom Rooms, Google Meet, Webex, BYOD/BYOM, or a mix
- ☐ Certified - device requirements and the platform's room guidance
- ☐ Licenses (room, management) and who buys them
- ☐ Resource accounts, calendar integration, room naming
- ☐ Content sharing: wired, wireless, or both

10.2 Camera placement

- Front of room, centered on the display wall, near seated eye level (directly above or below the display).
- Check field of view: the image width needed at distance D is $IS = 2 \times D \times \tan(A/2)$. Measure the width of the seating area at the **closest** seats; narrow lenses miss them.
- Larger rooms: multi-camera or speaker tracking. Classrooms: presenter-camera position (often the rear wall), distance and zoom; content camera for whiteboards.
- Look at what the camera sees: windows, glass walls into busy corridors, clutter, doors.

10.3 Lighting for video

- Aim for even, diffuse light from the front on faces. A common target is **300–500 lux at desk level** with consistent color temperature ($\approx$ **3,500–4,500 K**) across all fixtures.
- Avoid deep shadows from downlights and silhouettes from windows behind participants.
- Look for flicker from PWM-dimmed LEDs: view the fixtures through a phone camera at several dim levels.
- Measure and record daylight variation; recommend shades where needed.

10.4 Room checks specific to VTC

- ☐ Background noise and RT60 measured (Section 9); ceiling mics clear of diffusers
- ☐ Display arrangement: single, dual (people + content), or front-of-room plus touch display
- ☐ Table connectivity location; cable path to the table
- ☐ Scheduling panel outside the door: PoE drop, mount height within reach range, glass/sidelite mounting
- ☐ Network: platform bandwidth, QoS, firewall and proxy rules (Section 13)
- ☐ Wall finish behind participants (camera background)

COMMON VTC FAILURE MODES FOUND AT SURVEY

Window behind participants (silhouettes) · **window behind the display** (glare, camera exposure) · **diffuser over the table** (noise in ceiling mics) · **glass walls on three sides** (reverberation, no mount surface) · **long, narrow room** (camera can't frame the near and far seats; consider dual cameras or a different layout).

11 Control, User Interface & Integration

ENGINEER

A room is only as good as its first touch. Find out where users expect to start a meeting, and which building systems the AV system needs to talk to.

11.1 User interface

- **Where:** on the table (cable path through the table), on the wall by the door (ADA reach range 15"–48" AFF; operable with ≤ 5 lbf, 309.4), on a lectern, or in a mobile app.
- **What:** one-touch join, source selection, volume, lighting and shade presets, room combine/divide.
- **Who:** the most and least technical users. Design for the occasional user.

11.2 Existing control system

- Platform, processor model and firmware, touch panels.
- **Is the programming source code available, and who owns it?** Without it, plan for a rewrite.
- Licenses, cloud management portals, credentials (handled securely).

11.3 Divisible rooms

- Partition type and sensors; combine/divide modes; audio routing and AEC references in each mode; where the control panels sit in each configuration.

11.4 Building - system integration

SYSTEM	CAPTURE
Lighting	Manufacturer and protocol (DALI, 0–10 V, proprietary), zones, integration port (IP/RS-232), who programs it
Shades	Manual or motorized; motor type; control interface; power location
HVAC / BMS	Occupancy-based setpoints? BACnet or API? Who owns the BMS? (AVIXA TR-111)
Occupancy sensors	Shared with lighting? Available as contact closure or over the network?
Fire alarm	AHJs commonly require program audio to mute or pause on alarm (NFPA 72). Locate the FACP or nearest relay module and note who provides the relay (usually the FA contractor).
Scheduling / signage	Calendar platform, panels, wayfinding, content management
Security	Access control, cameras, privacy indicators, recording-consent policies

REMOTE MANAGEMENT

Ask early whether cloud monitoring and remote access are allowed (Section 13). It shapes the service offer and the design.

12 Power, Grounding & Thermal

ENGINEER

NEC

Never assume a receptacle is usable. Trace it, test it, and record its circuit. Then check where the heat will go, because racks in closets with no cooling fail early.

12.1 Receptacles & circuits

- ☐ Every receptacle near a device location: type, height AFF, distance from the reference corner
- ☐ Circuit ID (cover plate or panel schedule); dedicated or shared? What else is on it?
- ☐ Verify it's live and wired correctly with a receptacle tester
- ☐ Isolated-ground receptacles (orange, or marked with a triangle) and emergency or generator-backed circuits (often red): ask facilities
- ☐ Panel location, spare breaker spaces, panel schedule photographed
- ☐ Any equipment needing 208/240 V or more than 20 A (large LED walls, amplifier racks)

12.2 Capacity check

CIRCUIT	NOMINAL	CONTINUOUS (80%)
120 V · 15 A	1,800 W	1,440 W
120 V · 20 A	2,400 W	1,920 W
208 V · 20 A (1φ)	4,160 W	3,328 W
208 V · 30 A (1φ)	6,240 W	4,992 W

Continuous loads are sized at 125%, which in practice means loading a circuit to no more than 80% of its rating. The electrical engineer of record and the AHJ have final say.

12.3 Grounding, bonding & protection

- AV racks are bonded per ANSI/AVIXA F502.02 and the telecom bonding system (ANSI/TIA-607). Locate the telecom bonding busbar in the IDF.
- Different panels or buildings mean ground-potential differences. Plan fiber or isolation between buildings to avoid ground loops.
- Surge protection and power sequencing; network-managed PDUs for remote reboot.
- UPS: required for network, control and DSP? Existing capacity, runtime, battery age.
- Energy management (AVIXA S601.01): schedules, standby, metering.

12.4 Thermal

- Heat load: $\text{BTU/hr} = \text{W} \times 3.412$. 12,000 BTU/hr = 1 ton of cooling.
- Rack or closet: dedicated cooling? Return air? Louvered door? Room volume?
- **After-hours setback:** many buildings shut HVAC off nights and weekends, so closets overheat. Ask facilities.
- Credenzas and millwork racks need ventilation paths (front-to-back airflow, fans, cutouts).
- Displays in direct sun and outdoor equipment: temperature ratings and enclosures.

RACK CLEARANCE

Plan about **36" (≈ 914 mm)** clear in front of and behind racks that need rear access. That matches common electrical working-space practice. Confirm with owner standards and the AHJ, and check door widths for rack delivery.

13 Network & IT

ENGINEER

SALES

RP-C303.01

Modern AV is an IT system. Bring IT into the survey, capture the network facts on Form D, and start the security review early. It is often the critical path to go-live.

13.1 Physical layer

- ☐ Which IDF/MDF serves each room? Location and cable-path distance
- ☐ Channel length $\leq$ 100 m (328 ft) including patch cords (90 m permanent link + 10 m cords)
- ☐ Rack space, patch-panel ports, cabling category and condition
- ☐ Switch make/model, free ports, uplink speed, PoE budget and per-port class
- ☐ Existing drops in each room: count, location, labels, live or not (test them)
- ☐ Who supplies switches and structured cabling: owner, cabling contractor or integrator?

13.2 Typical drops per room (plan, then confirm)

DEVICE	PORTS	NOTES
Codec / room PC / compute	1-2	Some need 2 (LAN + device network)
Touch panel (table/wall)	1	PoE
Camera(s)	1 each	PoE / PoE+ for PTZ
Ceiling mic / DSP / amp	1 each	Dante/AES67: PoE
Display(s)	1 each	Control and monitoring
Control processor	1-2	Often a separate control LAN
Wireless presentation	1	Network segmentation
Scheduling panel	1	PoE, outside the door
Spare	$\geq$ 1-2	Future devices

13.3 Logical & security

- VLANs (AV, control, AV-over-IP), DHCP vs. static or reservations, DNS, NTP.
- 802.1X / NAC and MAC registration; certificate requirements.
- Internet egress for cloud platforms: firewall rules, proxies, **SSL inspection** (often breaks UC devices; plan exemptions).
- **Multicast** for AV-over-IP and Dante: IGMP snooping with a querier on the VLAN.
- **QoS**: Dante hardware tags PTP events DSCP 56 (CS7) and audio DSCP 46 (EF). Switches must be configured to honor them. Audinate also recommends turning off Energy-Efficient Ethernet on Dante ports.
- Bandwidth: 1 GbE to most devices; 10 GbE for uncompressed AV-over-IP; per-call bandwidth from the UC platform's network guide.
- Wi-Fi: coverage in the room, guest/BYOD network, wireless-presentation isolation, RF congestion.
- Hardening per AVIXA RP-C303.01: change default credentials, firmware management, logging, least privilege.
- Remote access and monitoring: allowed? VPN or cloud? Who gets accounts?

PROCUREMENT RESTRICTIONS

Section 889 of the FY2019 NDAA bars federal agencies, and contractors doing business with them, from covered telecom and video-surveillance equipment made by Huawei, ZTE, Hytera, Hikvision, Dahua and their subsidiaries. Many states and grant programs add similar rules. Check the owner's approved-vendor list and TAA/"Buy American" requirements before you design.

14 Pathways & Infrastructure

ENGINEER

NEC

TIA-569

Every device needs a path back to the rack. Trace each one in person. If you can't see it, assume it isn't there.

14.1 Trace every path

- From each device location to the rack or IDF: above ceiling, in wall, in floor, in furniture, or surface raceway.
- Photograph above-ceiling conditions at the device and along the route.
- Note fire-rated walls (labels above the ceiling, life-safety plans) that the route crosses.
- Hard-lid or concrete with no access means access panels or surface raceway, which need aesthetic approval.

14.2 Conduit (ANSI/TIA-569 & NEC Ch. 9)

Bends	≤ two 90° bends (180° total) between pull points
Length	≤ 30 m (100 ft) between pull points
Bend radius	≥ 6× inside diameter (≤ 2" conduit); ≥ 10× (> 2")
Fill	1 cable 53% · 2 cables 31% · 3+ cables 40%
Jam ratio	3 cables with ID ÷ OD between 2.8 and 3.2 risk jamming
Existing	Size, fill, pull string present? Condition at both ends?

14.3 Floor & furniture

- Existing floor boxes: size, device capacity, conduit size, where the conduit goes.
- **New cores in an elevated slab:** assume post-tensioned until proven otherwise. GPR or X-ray scanning and structural approval are required before coring.
- Table grommets, cubbies and leg raceways: coordinate with the furniture vendor.

14.4 Code items to check

NFPA 70 (NEC): CONFIRM WITH THE ADOPTED EDITION

- **Support (300.11):** cables must not be supported by the ceiling grid or its support wires. Use independent support (J-hooks, tray) from structure; independent support wires must be distinguishable.
- **Plenum:** cables in return-air plenums must be plenum-rated (e.g., CMP, CL2P/CL3P) or run in suitable raceway.
- **Firestopping (300.21):** penetrations of fire-rated assemblies must be sealed with a listed firestop system.
- **Separation** of power-limited and communications cabling from power conductors.

14.5 Signal distance planning

TRANSPORT	PRACTICAL REACH
Ethernet / Dante (copper)	100 m channel
HDBaseT long-reach, shielded Cat 6A, 4K	up to 100 m
HDBaseT standard-reach, Cat 6, 4K	~40 m (70 m 1080p)
Passive HDMI, 4K60 18 Gbps	~15 ft rule of thumb
USB 2.0 passive	5 m
USB 3.x passive	~3 m
Multimode OM3 / OM4 (10GBASE-SR)	300 m / 400 m
Single-mode (10GBASE-LR)	10 km

Product specs govern. HDBaseT: home-run cables with minimal terminations and solid-core cable; avoid couplers, keystones and pass-through RJ45s (Atlona guidance).

14.6 Labeling

Record the owner's existing scheme. AVIXA F501.01 calls for labels at **both ends** of every cable, readable and durable. ANSI/TIA-606 covers structured cabling.

15 Structural & Mounting

ENGINEER

Know exactly what every mount will attach to. A wrong guess here is a safety problem, not just a change order.

SUBSTRATE	SURVEY & MOUNTING NOTES
Wood stud	Spacing (16"/24" o.c.); lag into studs or add blocking for off-stud positions
Metal stud	Gauge (heavier = stronger); backing almost always required for displays (plywood or steel strap installed before drywall)
CMU (block)	Hollow or grouted? Anchor type differs; avoid mortar joints
Poured concrete	Wedge or sleeve anchors; scan for rebar, conduit and post-tension tendons
Brick / veneer	Veneer is not structural; attach through to the backup wall
Glass / demountable	No direct mounting: floor stands, mullion or partition-system mounts
Ceiling / deck	Deck type, joists, beams; add unistrut or structural attachments; never hang from the grid

- **Loads:** list the weight of every display, mount, projector, speaker cluster, mic array and screen. Large or overhead loads need engineered attachments and a qualified rigger.
- **Mount listings:** UL 2442 (or equivalent) with margin over the actual load. Use fasteners suited to the substrate; drywall anchors alone are never enough for displays.
- **Backing on construction projects:** mark exact backing locations on the drawings and make sure the GC installs it *before* drywall.
- **Seismic:** where required, racks, ceiling devices and suspended equipment need engineered bracing. Some agencies (for example California HCAI for healthcare) require plan review.
- **Restrictions:** historic buildings, landlord rules and warranty-sensitive finishes may limit penetrations. Get it in writing.

STOP AND ESCALATE

Unknown substrate, cracked or deteriorated structure, an intended overhead load above an occupied area with no engineered attachment, or a customer insisting you mount to something you have doubts about.

16 Existing Systems Audit

ENGINEER

SALES

"Reuse what we have" saves money only if the equipment works, is supported and fits the new design. Test it; don't take it on faith.

16.1 Inventory (Form E)

- ☐ Device, manufacturer, model, serial, firmware
- ☐ Location and mounting; age; owned or leased
- ☐ Condition: good / fair / poor, from powering it on and testing it
- ☐ Support status: end-of-sale or end-of-life? Warranty or service contract?
- ☐ Reuse decision: **Reuse** · **Relocate** · **Retire** · **Verify**

16.2 Functional checks

- Power on; test each input and output; note burn-in, dead pixels, color shift.
- Projector lamp or laser hours, fan noise, filter condition.
- Microphone and speaker function; audible hum or buzz (ground issues).
- Existing cabling: category, condition, test results if reusing.

16.3 Documentation & code

- As-builts, signal-flow drawings, IP schedules, passwords (handled securely).
- **Control and DSP program files:** where are they, and who owns them? Contract terms may give the original integrator ownership of the code.
- Sketch the current signal flow on site. Flag legacy formats (VGA, composite, analog audio) that need conversion or retirement.

16.4 Removal & disposal

- Who removes and disposes of retired equipment? Is asset tagging or data wiping required (codecs, PCs, recorders)?
- Projector lamps can contain mercury, and batteries are regulated: follow universal-waste and e-waste rules.
- Patch and paint after removal: whose scope is it?

17 Logistics, Safety & Compliance

BOTH

OSHA · ADA

17.1 Logistics

- ☐ Delivery path: dock, freight elevator (interior W × D × H, door, capacity), corridors, tight turns, smallest door. Compare with the largest carton; very large displays ship in cartons much bigger than the screen.
- ☐ Dock hours, elevator reservation process, union or building-labor rules
- ☐ Staging and secure storage; debris and packaging removal
- ☐ Work hours: occupied building means after-hours work for noise, dust or ceiling access
- ☐ Parking, badging and escort for the install crew; site contacts
- ☐ Lift or scaffold needs for high ceilings; floor protection

17.2 Safety on survey day

- **Ladders:** use the right ladder for the task and keep three points of contact while climbing. Never use the top step or top cap of a stepladder as a step (OSHA 1926.1053).
- **Above the ceiling:** energized wiring, sharp edges, debris, insulation. Use gloves, eye protection and a dust mask.
- **Asbestos:** OSHA presumes thermal-system insulation and surfacing material in buildings constructed **no later than 1980** contain asbestos (PACM) unless tested (29 CFR 1926.1101). Don't drill or disturb suspect materials (old floor tile and mastic, plaster, pipe insulation, fireproofing). Ask for the asbestos survey.
- **Healthcare:** above-ceiling work typically requires an Infection Control Risk Assessment (ICRA) permit and dust containment. Respect patient privacy.
- **Hands off:** energized electrical, fire-alarm devices, sprinklers, security hardware.

17.3 Compliance checklist

ITEM	CAPTURE
Permits & licensing	Low-voltage permit and license requirements vary by state and city. Who pulls the permit?
ADA	ALS in assembly areas (219/706); reach ranges (308); protruding objects (307); operable parts (309)
Fire alarm	Mute/pause interface (NFPA 72); FACP or relay location; FA contractor contact
Fire-rated assemblies	Rated walls, ceilings and floors crossed; firestopping responsibility
Plenum	Return-air plenum? Cable ratings
Public sector	Prevailing wage (e.g., Davis-Bacon on federally funded work), bonding, background checks (K-12), E-Verify, Buy American / TAA, NDAA §889
Secure spaces	SCIFs and secure rooms restrict wireless, Bluetooth, cameras and mics. Security-officer approval and cleared personnel may be required.
Privacy & recording	Recording-consent policy, camera privacy indicators, data retention
Landlord / historic	Work letters, approved contractors, penetration limits, after-hours rules

18 Photo & Documentation Standard

ENGINEER

Photos are the survey's memory and your protection. Use the same sequence in every room so anyone on the team can find what they need without having been there.

- 01 Room ID first:** photograph the room-number sign. Every photo after it belongs to that room.
- 02 Corners:** stand in each corner and shoot the opposite corner (four photos).
- 03 Walls:** each wall straight on: N, E, S, W.
- 04 Ceiling and floor:** grid, fixtures, diffusers, sprinklers, floor boxes (open them).
- 05 Above the ceiling** at every device location and along the cable route.
- 06 Every outlet, plate and box** with a tape measure in the frame for scale and height.
- 07 Existing equipment:** front, rear connections, nameplates and labels.
- 08 Windows and glare** at the time of the survey (note the time).
- 09 Pre-existing damage:** scuffs, cracks, stains, broken tiles. This protects you.
- 10 Infrastructure:** rack front and rear, patch-panel labels, switch model and free ports, electrical panel schedules, delivery-path pinch points.

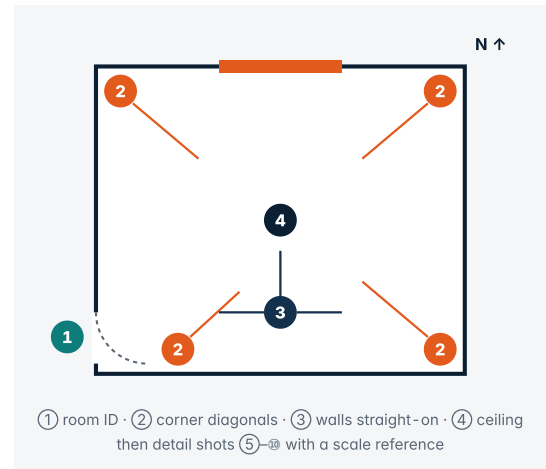


Figure 18.1 · Standard room photo sequence

CAPTURE RULES

- Shoot wide, then medium, then detail. Landscape orientation. Flash off when photographing screens.
- Include a scale reference (tape measure) in every detail shot.
- Record a narrated video walkthrough and a 360° capture of each room.
- File names: SITE_ROOM_##_Subject.jpg, e.g., HQ3F_CONF301_04_DisplayWall.jpg.
- Upload the same day to the shared project folder, dated and version-controlled.

SKETCH STANDARD

- Plan view with a north arrow and reference corner; dimension clockwise.
- Use one unit system per project (ft-in or mm) and don't mix them.
- Heights as AFF; give each elevation a wall label (N/E/S/W).
- Use a symbol legend: display, camera, mic, speaker, power, data, floor box, rack.
- Tag every number with M / D / C / E.

After the Visit

Turn the survey into a report, a risk register and a clean handoff, and keep scope creep from eating the margin.

19 Survey Report & Handoff

20 Red Flags & Scope Guardrails

19 Survey Report & Handoff

ENGINEER

SALES

A survey only pays off if it turns into a clear report that design, estimating and project management can work from without making a second trip. Structure it to feed the documentation framework in ANSI/AVIXA D401.01.

19.1 Report contents

- 01 Summary:** customer, site, date, attendees, rooms surveyed, survey type.
- 02 Goals and use cases** from discovery and the walkthrough, in the customer's words.
- 03 Room-by-room findings:** sketch, dimensions, photos, DISCAS check, light and noise readings, infrastructure status, room-specific risks.
- 04 Infrastructure required from others:** circuits, backing, conduit, drops, cores, millwork, access panels, FA relay.
- 05 Risk register:** risk, impact, likelihood, mitigation, owner.
- 06 Assumptions and exclusions** that will carry into the SOW.
- 07 Open questions / RFIs:** owner and due date for each.
- 08 Preliminary concept** per room type (no final BOM until engineering review).
- 09 Logistics and schedule constraints.**
- 10 Appendices:** forms, photo index, readings, scans.

19.2 Timeline

WHEN	WHAT	WHO
Same day	Photos and forms uploaded to the project folder	ENG
≤ 24 h	Recap email: thanks, key findings, RFIs, next steps	SALES
≤ 48 h	Internal debrief; risk register drafted	BOTH
As promised	Survey report and proposal or design package	BOTH

19.3 Risk register format

RISK	IMPACT	LIKELY	MITIGATION / OWNER
Display wall is metal stud; backing unknown	High	Med	Open inspection or add backing; GC
No ceiling access in Conf 301 (hard lid)	Med	High	Two access panels; owner approval
Security review not started	High	High	Send network requirements this week; IT

INTERNAL HANDOFF (AFTER AWARD)

Hold an internal kickoff: sales → engineering → PM. Share discovery notes, the stakeholder map, the survey report, photos, and **every commitment made to the customer**. If a commitment isn't in the SOW, it either goes in or is explicitly withdrawn.

19.4 Responsibility matrix ("by others")

Agree on this with the customer and the other trades before pricing. Typical split shown; confirm on every project.

ITEM	AV INTEGRATOR	ELECTRICAL	GC	OWNER IT	FACILITIES	FURNITURE
Dedicated circuits and receptacles	◀	●				
Recessed AV/power boxes behind displays	● supply	● install/power				
In-wall backing / blocking	◀ locate		●			

ITEM	AV INTEGRATOR	ELECTRICAL	GC	OWNER IT	FACILITIES	FURNITURE
Conduit, boxes, sleeves, pull strings	◄ design	●				
Structured cabling (data drops)	◄			●		
Network switches, VLANs, ports, QoS	◄ specify			●		
AV cabling, devices, programming, commissioning	●					
Access panels, patch and paint			●		◄	
Core drilling and slab scanning	◄	◄	●			
Fire-alarm relay / interface	◄ connect				● FA contractor	
Table cutouts, grommets, power/data modules	◄ specify	◄ power				●
Acoustic treatment	◄		●			
Platform licenses, resource accounts	◄ configure			●		

● responsible · ◄ supports, specifies or coordinates. On design-build projects without a GC, reassign GC items explicitly.

20 Red Flags & Scope Guardrails

SALES

ENGINEER

Most margin is lost before the contract is signed. These patterns show up again and again; spotting them at the survey lets you price, phase or qualify the risk instead of absorbing it.

RED FLAG	WHY IT MATTERS	WHAT TO DO
Decision maker absent or unknown	Scope churn; stalled deal; late surprises	Re-qualify before deep design; ask for a sponsor meeting
IT not engaged	Go-live blocked by security review, ports or VLANs	Get IT to the survey; send network requirements early
Construction schedule unclear	Infrastructure not ready; return trips	Get the schedule; price remobilizations; plan pre-install verification
Glass walls / no solid display wall	Mounting and pathway problems	Floor stands, mullion mounts; get aesthetic approval early
Hard lid or concrete, no access	Labor, patching and aesthetics	Access panels or surface raceway, priced and approved
Elevated slab, floor boxes wanted	Post-tensioned tendons; structural risk	Scanning plus structural approval, or a furniture/wall alternative
Building built 1980 or earlier	Presumed asbestos; work stoppage	Get the asbestos survey before any penetration; exclude abatement
High RT60 or noisy HVAC	Poor VTC audio whatever the equipment	Quote treatment and HVAC fixes as line items; document the risk
Window behind display or participants	Washout, silhouettes	Shades, a brighter display, or a layout change
Owner-furnished equipment	Compatibility, warranty, finger-pointing	Define OFE terms in the SOW; test before integrating
"Same as the other room"	Rooms are rarely identical	Survey every room; at least verify dimensions and infrastructure
Go-live earlier than lead times	Missed date; damaged relationship	Check lead times; offer phasing or interim solutions

SCOPE-CREEP GUARDRAILS

- Write down every request during the walkthrough and tag it: **in scope**, **option**, or **future phase**.
- No verbal commitments to model numbers or features until engineering validates them.
- Put a "parking lot" of future-phase ideas in the recap email so nothing is lost and nothing is implied.
- Explain the change-order process in the proposal; get changes signed before doing extra work.
- Re-survey if construction drawings change or significant time passes before award.

EXCLUSIONS TO CONSIDER IN EVERY SOW

- | | |
|--|---|
| ☐ Electrical work | ☐ Network switches and configuration |
| ☐ Patch and paint | ☐ Structured cabling |
| ☐ Permits and fees | ☐ Furniture modifications |
| ☐ After-hours labor | ☐ Acoustic treatment |
| ☐ Core drilling and scanning | ☐ Structural engineering |
| ☐ Asbestos / hazmat abatement | ☐ Licenses and subscriptions |

State assumptions plainly, e.g., "Assumes accessible ACT ceiling and an existing 20 A circuit within 6 ft of the display location."

Quick Reference

Formulas and lookup tables for displays, projection, cameras, audio, power, thermal, pathways, PoE, ADA and RF spectrum.

21 Formulas

22 Reference Tables

21 Formulas

ENGINEER

AVIXA CTS-D

The math behind the survey. Display and audio formulas follow ANSI/AVIXA V202.01 and AVIXA's CTS-D formula sheet (2024). Use consistent units throughout each calculation.

DISPLAYS & IMAGES

DISCAS · BASIC DECISION MAKING

V202.01

$$IH = FV \div (200 \times \%EH)$$

$$FV_{max} = IH \times \%EH \times 200$$

IH image height · **FV** farthest viewer distance (same units) · **%EH** smallest element height ÷ IH (as a decimal) · **200** BDM acuity factor

DISCAS · ANALYTICAL DECISION MAKING

V202.01

$$IH = (FV \times VR) \div 3438$$

$$FV_{max} = (IH \div VR) \times 3438$$

VR vertical resolution of the content (pixels) · **3438** ADM acuity factor ($\approx$ arc-minutes per radian; each pixel subtends 1 arc-minute)

75" 16:9 (IH 36.8"), 1080-line content → $FV_{max} = 36.8 \div 1080 \times 3438 \approx 117"$ (9.8 ft)

CLOSEST VIEWER (BDM)

V202.01

$$CV = (IH + IO) \times 1.732$$

IO image offset = bottom of image AFF – viewer eye height (negative if the image bottom is below eye level) · **1.732** = $1 \div \tan 30^\circ$ · Horizontal: no seat may exceed 60° to any part of the image.

DISPLAY GEOMETRY FROM DIAGONAL

$$16:9 \rightarrow H = 0.490 \times \text{diag} \cdot W = 0.872 \times \text{diag}$$

$$16:10 \rightarrow H = 0.530 \times \text{diag} \cdot W = 0.848 \times \text{diag}$$

$$4:3 \rightarrow H = 0.600 \times \text{diag} \cdot W = 0.800 \times \text{diag}$$

Inverse: $\text{diag} = IH \div 0.490$ (16:9). Uses active image area, not bezel.

PROJECTOR LUMENS

AVIXA CTS-D

$$\text{Lumens} = (L \times C \times A \div Sg) \div Dr$$

L ambient light at screen (fc with ft^2 , or lux with m^2) · **C** target contrast (7, 15, 50, 80) · **A** screen area · **Sg** screen gain (assume 1) · **Dr** derating (assume 0.75)

10 fc, 15:1, 8 ft × 4.5 ft (36 ft^2), gain 1 → $10 \times 15 \times 36 \div 0.75 = 7,200 \text{ lm}$

THROW & CAMERA FIELD OF VIEW

$$\text{Throw distance} = \text{throw ratio} \times \text{image width}$$

$$IS = 2 \times D \times \tan(A \div 2)$$

$$A = 2 \times \text{atan}(IS \div 2D)$$

IS image (frame) width at distance **D** · **A** horizontal angle of view. Check against the seating width at the closest seats.

LED PIXEL PITCH VS. DISTANCE

$$D(1' \text{ arc}) \approx \text{pitch} \times 3438$$

Distance beyond which a 20/20 viewer can no longer resolve individual pixels (same 1-arc-minute basis as ADM). Same units in and out: $2.5 \text{ mm} \times 3438 \approx 8.6 \text{ m}$. Closer viewers may see pixel structure.

LIGHT & LUMINANCE UNITS

$$1 \text{ fc} = 10.764 \text{ lux} \cdot 1 \text{ lux} = 0.0929 \text{ fc}$$

$$1 \text{ fL} = 3.426 \text{ cd/m}^2 \text{ (nits)}$$

Contrast (V201.01) is measured in the room with an ANSI 4×4 checkerboard: mean white ÷ mean black luminance.

AUDIO & ACOUSTICS

CEILING LOUDSPEAKER COVERAGE

AVIXA CTS-D

$$D = 2 \times (H - h) \times \tan(C \div 2)$$

D coverage diameter at ear height · **H** ceiling height · **h** ear height (48" seated) · **C** coverage angle. Spacing: edge-to-edge = $2r$ · minimum overlap = $r/2$ · center-to-center = r ($r = D \div 2$).

DISTANCE LOSS & SUMMING

$$\Delta L = 20 \log(d2 \div d1) \text{ } (\approx 6 \text{ dB per doubling})$$

$$L_{total} = 10 \log \Sigma 10^{(Li \div 10)}$$

Point source, free field. Two equal incoherent sources = +3 dB.

POWER AT THE LOUDSPEAKER

AVIXA CTS-D

$$EPR = 10^{[(L_p + H - L_s + 20 \log(D_2 \div D_r)) \div 10]} \times W_{ref}$$

L_p SPL required at listener · H headroom (dB) · L_s sensitivity (1 W / 1 m) · D_2 loudspeaker-to-listener · D_r reference distance (1 m) · W_{ref} 1 W

AMPLIFIER SIZING & IMPEDANCE

AVIXA CTS-D

$$70/100 \text{ V: } W_t = W \times N \times 1.5$$

$$Z_t = 1 \div (1/Z_1 + 1/Z_2 + \dots + 1/Z_n) \cdot \text{equal: } Z \div N$$

W tap per loudspeaker · N number of loudspeakers · $1.5 = 50\%$ headroom

ACOUSTIC GAIN & FEEDBACK STABILITY

AVIXA CTS-D

$$NAG = 20 \log(D_0 \div EAD) \quad PAG = 20 \log[(D_0 \times D_1) \div (D_2 \times D_s)] - 10 \log(NOM) - FSM \text{ Stable when } PAG \geq NAG$$

D_0 talker to farthest listener · D_1 mic to nearest loudspeaker · D_2 loudspeaker to farthest listener · D_s talker to mic · EAD equivalent acoustic distance · NOM number of open mics · FSM feedback stability margin (commonly 6 dB)

REVERBERATION TIME (SABINE)

$$RT_{60} = 0.049 \times V \div A \text{ (ft}^3, \text{ sabins)}$$

$$RT_{60} = 0.161 \times V \div A \text{ (m}^3, \text{ m}^2)$$

$A = \Sigma$ (surface area × absorption coefficient). Most accurate in fairly diffuse rooms; use as a survey estimate.

SIGNAL BANDWIDTH

AVIXA CTS-D

$$R = H \times V \times C \times 3 \times fps \times 1.25$$

R bits/s · H × V active pixels · C bits per color · 3 colors · 1.25 TMDS overhead. 4K60, 8-bit $\approx 3840 \times 2160 \times 8 \times 3 \times 60 \times 1.25 \approx 14.9$ Gbps.

POWER, THERMAL & PATHWAYS

POWER

$$P = V \times I \cdot I = P \div V$$

Continuous $\leq 80\%$ of breaker rating

120 V × 20 A = 2,400 W → 1,920 W continuous. Use nameplate or measured draw, not amplifier rated output.

HEAT LOAD

AVIXA CTS-D

$$BTU/hr = W \times 3.412$$

$$\text{Amp: } BTU/hr = W \times 3.412 \times (1 - \text{efficiency})$$

Tons of cooling = BTU/hr ÷ 12,000. (The CTS-D sheet rounds 3.412 to 3.4.)

CONDUIT CAPACITY

NEC CH. 9 · CTS-D

$$1 \text{ cable: } ID > \sqrt{(OD^2 \div 0.53)}$$

$$2 \text{ cables: } ID > \sqrt{((OD_1^2 + OD_2^2) \div 0.31)}$$

$$3+: ID > \sqrt{(\Sigma OD^2 \div 0.40)}$$

JAM RATIO

AVIXA CTS-D

$$J = ID \div [(OD_1 + OD_2 + OD_3) \div 3]$$

With three similar cables, J between 2.8 and 3.2 risks jamming at bends. Change conduit size or cable count.

22 Reference Tables

BOTH

22.1 Minimum 16:9 size by farthest viewer

FARTHEST VIEWER	%EH 5%	%EH 4%	%EH 3%
8 ft	9.6" / 20"	12.0" / 24"	16.0" / 33"
10 ft	12.0" / 24"	15.0" / 31"	20.0" / 41"
12 ft	14.4" / 29"	18.0" / 37"	24.0" / 49"
15 ft	18.0" / 37"	22.5" / 46"	30.0" / 61"
18 ft	21.6" / 44"	27.0" / 55"	36.0" / 73"
20 ft	24.0" / 49"	30.0" / 61"	40.0" / 82"
25 ft	30.0" / 61"	37.5" / 76"	50.0" / 102"
30 ft	36.0" / 73"	45.0" / 92"	60.0" / 122"
35 ft	42.0" / 86"	52.5" / 107"	70.0" / 143"
40 ft	48.0" / 98"	60.0" / 122"	80.0" / 163"
50 ft	60.0" / 122"	75.0" / 153"	100.0" / 204"

Cells: minimum image height / minimum 16:9 diagonal.

IH = FV ÷ (200 × %EH); diagonal = IH ÷ 0.490. Round up to the next available size, then confirm the closest viewer and horizontal angles. Anything above ~98–110" usually means projection, LED, or multiple displays.

22.2 16:9 display dimensions

DIAGONAL	WIDTH	HEIGHT	MAX FV 4%	MAX FV 3%
55"	47.9"	27.0"	18.0 ft	13.5 ft
65"	56.7"	31.9"	21.2 ft	15.9 ft
75"	65.4"	36.8"	24.5 ft	18.4 ft
85"	74.1"	41.7"	27.8 ft	20.8 ft
98"	85.4"	48.0"	32.0 ft	24.0 ft
100"	87.2"	49.0"	32.7 ft	24.5 ft
110"	95.9"	53.9"	36.0 ft	27.0 ft
120"	104.6"	58.8"	39.2 ft	29.4 ft

Active image area. Max FV per BDM; real panels differ slightly by model.

22.3 LED pitch: pixel-resolvable distance

PIXEL PITCH	DISTANCE	≈ FEET
0.9 mm	3.1 m	10 ft
1.2 mm	4.1 m	14 ft
1.5 mm	5.2 m	17 ft
1.9 mm	6.5 m	21 ft
2.5 mm	8.6 m	28 ft
3.9 mm	13.4 m	44 ft

22.4 Power over Ethernet (IEEE 802.3)

STANDARD	TYPE	AT PSE	AT DEVICE
802.3af (PoE)	1	15.4 W	12.95 W
802.3at (PoE+)	2	30 W	25.5 W
802.3bt (PoE++)	3	60 W	51 W
802.3bt (PoE++)	4	90 W	71.3 W

Check the switch's total PoE budget as well as per-port class. PTZ cameras with heaters, some touch displays and LED fixtures need Type 3–4.

22.5 Contrast minimums (AVIXA V201.01)

Passive viewing	7:1	Basic decision making	15:1
Analytical decision making	50:1	Full-motion video	80:1

22.8 ADA quick reference (2010 Standards)

Reach range (308)	Unobstructed forward or side reach: 15" min, 48" max AFF
Protruding objects (307.2)	Leading edge 27"–80" AFF: max 4" protrusion into circulation path
Operable parts (309.4)	One hand; no tight grasping, pinching or wrist twisting; ≤ 5 lbf
ALS (219 / 706)	Assembly areas with amplification; receivers per Table 219.3; signage per 216.10

22.9 U.S. wireless microphone spectrum (FCC)

BAND	STATUS
470–608 MHz	TV channels below 608 MHz: unlicensed (and licensed) on open channels; coordinate
614–616 MHz	600 MHz guard band: unlicensed

22.6 Acoustic targets

Conference / teleconference	NC 25-30	ASHRAE
Courtroom · worship	NC 25-30	ASHRAE
Private office	NC 30-35	ASHRAE
Classroom background	≤ 35 dBA	S12.60
Classroom RT60 (<10k ft³ / 10–20k ft³)	≤ 0.6 / 0.7 s	S12.60
ALS signal-to-noise	≥ 18 dB	ADA 706

22.7 Video-room lighting (common targets)

Illuminance at desk level	300–500 lux
Color temperature, all fixtures	≈ 3,500–4,500 K
Direction	Diffuse, from the front; no strong downlight shadows or backlight

BAND	STATUS
617–652 / 663–698	Prohibited since July 13, 2020 (600 MHz service band)
653–657 MHz	Duplex gap: licensed
657–663 MHz	Duplex gap: unlicensed
698–806 MHz	Prohibited (700 MHz, since 2010)
902–928 MHz	Unlicensed (ISM)
941.5–944 · 1435–1525	Licensed
1920–1930 MHz	Unlicensed (DECT)
2.4 GHz · 5 GHz	Unlicensed (portions); shared with Wi-Fi

22.10 Handy conversions

1 m = 3.281 ft · 1 ft = 0.3048 m	1 in = 25.4 mm
1 W = 3.412 BTU/hr	1 ton = 12,000 BTU/hr
1 fc = 10.764 lux	1 fL = 3.426 nits
1 lb = 0.4536 kg	Seated eye ≈ 48" (1.22 m)

Field Forms

Print, clip and carry. Forms A–G cover the site, each room, equipment rooms, network, inventory, large venues and closeout.

23 Using the Field Forms

A Project & Site Logistics

B1 Room Survey: Architecture

B2 Room Survey: Systems

C Equipment Room · IDF · Rack

D Network & IT

E Existing Equipment Inventory

F Large-Venue Add-On

G Survey Closeout & Sign-Off

23 Using the Field Forms

BOTH

Print single-sided. Clip one Form A per site, one B1 + B2 pair per room, one C per equipment location, and one D per site. Add E for refresh projects and F for large venues. End every survey with G.

FORM	TITLE	QUANTITY	COMPLETED BY / WHEN
A	Project & Site Logistics	1 per site	Sales pre-fills from discovery; both complete at kickoff
B1	Room Survey: Architecture	1 per room	Engineer, in the room; sketch and photo sequence
B2	Room Survey: Systems	1 per room	Engineer, in the room; readings, power, network, risks
C	Equipment Room · IDF · Rack	1 per location	Engineer, with IT/facilities escort
D	Network & IT	1 per site	Engineer with the customer's IT contact
E	Existing Equipment Inventory	As needed	Engineer or service lead on refresh and takeover projects
F	Large-Venue Add-On	1 per venue	Engineer; auditoriums, worship, multipurpose
G	Survey Closeout & Sign-Off	1 per site	Sales leads the closeout meeting; both sign

FIELD TIPS

- Write the room number on every page before you start.
- Tag every number with its source: **M** measured · **D** drawings · **C** customer · **E** estimated.
- Photograph each completed form before you leave the site, as a backup.
- Use the sketch grid at ½" major squares; write your scale (e.g., ½" = 2 ft).

DIGITAL OPTION

These forms map directly onto fields in a survey app or CRM. Keep the same section order so reports and estimating templates stay consistent across the team.

A**Project & Site Logistics**

Complete before and during kickoff · one per site

Project _____

Date _____

By _____

Page _____

PROJECT

Customer _____ Site / building _____

Address _____ Project name / # _____

Survey type: ☐ Discovery walkthrough ☐ Detailed technical ☐ Pre-install verification ☐ Existing-system audit

Time in _____ Time out _____ Surveyors _____

SITE CONTACTS

ROLE	NAME	PHONE	EMAIL	AT SURVEY?
Executive sponsor				
End-user champion				
IT / network				
Facilities				
Security				
Architect / GC				
Electrical contractor				
Other				

DISCOVERY SUMMARY

Goals / success criteria _____

Platforms: ☐ Teams ☐ Zoom ☐ Google Meet ☐ Webex ☐ BYOD / BYOM ☐ Other _____

Budget range _____ Funding source _____ Decision date _____

Required go-live _____ Blackout dates _____ Competitors _____

Procurement: ☐ Direct ☐ RFP / bid ☐ Cooperative contract ☐ GSA ☐ Other _____

Requirements: ☐ Prevailing wage ☐ Union labor ☐ NDAA §889 ☐ TAA / Buy American ☐ Background checks ☐ Bonding

SITE LOGISTICS

Year built _____ Owned / leased _____ Landlord approval? _____

Asbestos survey available: ☐ Yes ☐ No ☐ Unknown

Allowed work hours _____ Badging / escort _____ Parking _____

Dock hours / height _____ Freight elev. W×D×H _____ in Elev. capacity _____ lb

Elev. door W×H _____ in Smallest door on path _____ in Tightest turn _____ in

Staging / storage _____ Debris removal _____

☐ Photography permitted ☐ COI on file ☐ Safety orientation done ☐ PPE: hard hat / hi-vis / boots ☐ ICRA permit (healthcare)

DOCUMENTS RECEIVED

☐ Floor plans ☐ RCP ☐ Elevations ☐ Electrical / panel sched. ☐ Mechanical ☐ Structural ☐ Life-safety plan ☐ Owner AV/IT standards

☐ Network diagram ☐ AV as-builts ☐ Construction schedule

B1**Room Survey: Architecture**

One per room · finish before leaving the room · tag numbers M / D / C / E

Project _____

Date _____

By _____

Page _____

Room # _____ Room name _____ Floor / bldg _____

Type: ☐ Huddle ☐ Conference ☐ Boardroom ☐ Training ☐ Classroom ☐ Lecture ☐ Auditorium ☐ Multipurpose ☐ Worship
☐ Other

Seats typical _____ Seats max _____ Users / dept _____

Use: ☐ Presentation ☐ VTC / hybrid ☐ Lecture capture ☐ Streaming ☐ Events ☐ Signage ☐ Divisible

Content: ☐ BDM (general) ☐ ADM (detail: CAD, spreadsheets, medical)

DIMENSIONS

Length	Width	Diagonal 1 / 2
Ceiling ht (main)	Soffit / bulkhead	Deck above clg
Door W × H	Table L × W × H	Windows (wall/size)

Ceiling: ☐ ACT 2×2 ☐ ACT 2×4 ☐ Hard lid ☐ Open / exposed ☐ Cloud / baffle

Plenum: ☐ Return-air plenum ☐ Ducted return ☐ Unknown

Access: ☐ Full ☐ Limited ☐ None (panels needed)

Floor: ☐ Slab on grade ☐ Elevated slab ☐ PT slab suspected ☐ Raised access floor ☐ Carpet ☐ Hard

WALLS

WALL	CONSTRUCTION (WOOD/METAL STUD, CMU, CONCRETE, GLASS)	STUDS: O.C. / GA.	TO DECK?	RATED?	NOTES
N					
E					
S					
W					

PLAN SKETCH · REFERENCE CORNER · DIMS · DEVICES · OBSTRUCTIONS

**PHOTO SEQUENCE COMPLETE**

☐ 1 Room ID ☐ 2 Corners ☐ 3 Walls N/E/S/W ☐ 4 Ceiling / floor ☐ 5 Above ceiling ☐ 6 Outlets w/ scale ☐ 7 Existing equip.

☐ 8 Windows / glare ☐ 9 Existing damage ☐ 360° / video

B2**Room Survey: Systems**

Displays · light · acoustics · AV · power · network · pathways · structure

Project _____

Date _____

By _____

Page _____

Room # _____ Room name _____

DISPLAY & SIGHTLINES (DISCAS)

Farthest viewer FV	Closest viewer CV	Seated eye ht
Usable wall W × H	Min. bottom of image AFF	%EH / content
Required IH	Selected size / qty	60° horiz. check

Display wall: ☐ Wood stud ☐ Metal stud ☐ Backing present ☐ Backing needed ☐ CMU ☐ Concrete ☐ Glass ☐ Recessed box

AMBIENT LIGHT (LUX OR FC)

SCENE / CONDITION	AT SCREEN	AT TABLE	TIME	BLINDS
All lights on				
Presentation / VTC scene				
Daylight, blinds open				

ACOUSTICS

dBA pos. 1	dBA pos. 2	dBA pos. 3	RT60 est.
------------	------------	------------	-----------

Noise sources _____ Hard surfaces % _____

Treatment: ☐ None ☐ Some ☐ Recommended

ALS: ☐ Required (assembly) ☐ Not required ☐ Existing

AUDIO · VIDEO · CONTROL

Mics: ☐ Ceiling array ☐ Table ☐ Lectern ☐ Wireless ☐ Beam-forming bar

Speakers: ☐ Ceiling ☐ Wall ☐ Soundbar ☐ Arrays

Camera: ☐ Above display ☐ Below display ☐ Rear (presenter) ☐ Multi-cam

UI: ☐ Table touch ☐ Wall touch ☐ Lectern ☐ Scheduling panel

Integrate: ☐ Lighting ☐ Shades ☐ HVAC/BMS ☐ Fire-alarm mute ☐ Occupancy

POWER & NETWORK

LOCATION	RECEPT. TYPE	CIRCUIT ID	DEDICATED?	TESTED	DATA DROPS (# / LIVE)	IDF / DISTANCE

PATHWAYS & STRUCTURE

Route: ☐ Above ACT ☐ In wall ☐ Floor box ☐ Furniture ☐ Surface raceway ☐ Conduit exists

Conduit size / fill _____ Floor box size / contents _____ Cores needed? _____

Rated walls crossed _____ Mount substrates _____

RISKS · RED FLAGS · NOTES

C

Equipment Room · IDF · Rack

One per equipment location · photos front and rear

Project

Date

By

Page

Location / room # _____ Serves rooms _____

Type: ☐ IDF ☐ MDF ☐ AV closet ☐ Credenza / millwork ☐ In-room rack ☐ Ceiling enclosure

SPACE

Rack type / size _____ RU RU available _____ Rack depth _____ in

Clear front _____ in Clear rear _____ in Door W × H _____ in

Floor space for new rack _____ Floor loading concerns _____

ENVIRONMENT

Cooling: ☐ Dedicated ☐ Building HVAC ☐ None ☐ After-hours setback

Temp. now _____ °F Ventilation / door type _____ Existing heat sources _____

POWER & BONDING

CIRCUIT / PANEL	VOLTS / AMPS	RECEPTACLE	DEDICATED?	GENERATOR?	LOAD NOW

UPS model / VA _____ UPS runtime / battery age _____

Bonding: ☐ TBB / TMGB present ☐ Rack bonded ☐ Not present

NETWORK

Switch make / model _____ Free ports _____ PoE budget / used _____ W

Uplink speed _____ Patch ports free _____ Label scheme _____

SWITCH / UNIT	PORT RANGE	SPEED	POE CLASS	VLAN(S)	NOTES

PATHWAYS INTO THE SPACE

Tray / conduit entries _____ Sleeves / fill _____ Firestopping condition _____

RACK ELEVATION / ROOM LAYOUT

Photos: ☐ Rack front ☐ Rack rear ☐ Patch panels ☐ Switch labels ☐ Panel schedule ☐ Entry pathways ☐ Cooling

D**Network & IT**

Complete with the customer's IT contact · attach IT standards if provided

Project _____

Date _____

By _____

Page _____

IT contact _____ Network owner (owner / landlord / MSP) _____

VLANS & ADDRESSING

PURPOSE	VLAN ID	SUBNET / MASK	DHCP / STATIC	GATEWAY	NOTES
AV devices					
Control					
AV-over-IP / Dante					
UC codecs / room PCs					
Wireless presentation					
Management					
Guest / BYOD					

SERVICES & POLICIES

DNS servers		NTP server	
Proxy (Y/N, address)		SSL inspection (exempt?)	
802.1X / NAC		MAC registration	
Firewall egress for platform		Multicast / IGMP querier	
QoS / DSCP honored		EEE disabled on AV ports	
Remote access (VPN / cloud)		Cloud management allowed	

WI-FI & RF

SSIDs (corp / guest) _____ Coverage in rooms _____ RF congestion notes _____

SECURITY & PROCUREMENT

☐ Security review required ☐ Approved-vendor list ☐ NDAA §889 ☐ TAA ☐ Default creds policy ☐ Firmware policy

Review lead time _____ Security contact _____

ACCOUNTS & LICENSING

Resource accounts by _____ Licenses purchased by _____ Calendar platform _____

PORT ALLOCATION

ROOM	DEVICE	WALL PLATE / PORT	SWITCH / PORT	VLAN	POE CLASS

E

Existing Equipment Inventory

Power on and test before marking condition · decision: R = Reuse · RL = Relocate · RT = Retire · V = Verify

Project

Date

By

Page

CONTROL / DSP PROGRAM FILES

[illegible]

STAGE & STRUCTURE

AUDIO & ALS

VIDEO, LIGHTING & BROADCAST

POWER

VENUE PLAN / SECTION · STAGE · FOH · RIGGING · CAMERA · ALS

A large grid of graph paper for drawing a venue plan. The grid is 20 units wide and 10 units high. A north arrow is located in the top right corner, pointing upwards and slightly to the right, with the letter 'N' below it.

NOTES



Survey Closeout & Sign - Off

Review with the customer at the closeout meeting

Project _____
 Date _____
 By _____
 Page _____

Attendees (customer) _____ Attendees (integrator) _____

KEY FINDINGS

OPEN QUESTIONS / RFIS

RFI #	QUESTION / INFORMATION NEEDED	OWNER	DUE

RISKS FLAGGED ON SITE

RISK	IMPACT (H/M/L)	MITIGATION PLAN	OWNER

CUSTOMER ACTIONS & NEXT STEPS

ACTION	WHO	BY WHEN

Recap email by _____ Survey report due _____ Proposal / design due _____

Signatures acknowledge that the site survey took place and that the findings above were reviewed. They do not constitute approval of scope, design or price.

 Customer representative · name · date

 Integrator representative · name · date

.. Sources & Further Reading

Primary standards are copyrighted and sold by their publishers. Buy current editions for design work. Online sources consulted October 2026.

1. **AVIXA · How to Conduct a Proper Site Survey (and Avoid Problems Later)**
<https://www.avixa.org/explore/articles/how-to-conduct-a-proper-site-survey-and-avoid-problems-later>
2. **AVIXA / InfoComm · Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industries**
https://cdn.avixa.org/production/docs/default-source/default-document-library/infocomm_avbp.pdf
3. **ANSI/INFOCOMM 2M-2010 Standard Guide for AV Systems Design and Coordination Processes (handbook preview)**
https://webstore.ansi.org/preview-pages/InfoComm/preview_ANSI+INFOCOMM+2M-2010+Handbook.pdf
4. **AVIXA · Published Standards list**
<https://www.avixa.org/resources/standards/published-standards>
5. **AVIXA · Display Image Size for 2D Content (ANSI/AVIXA V202.01)**
<https://www.avixa.org/resources/standards/display-image-size-for-2d-content>
6. **ANSI/INFOCOMM V202.01:2016 Display Image Size for 2D Content in Audiovisual Systems (text)**
<https://s3-us-west-1.amazonaws.com/tenxav/avixa-standards/ANSI-INFOCOMM-V202.01.2016-Display-Image-Size-for-2D-Content-in-Audiovisual-Systems.pdf>
7. **AVIXA · CTS-Prep Workshop: Aspect Ratio and DISCAS (2020)**
<https://cdn.avixa.org/production/docs/default-source/default-document-library/cts-prep-aspect-ratio-and-discas-apr2020.pdf>
8. **AVIXA · CTS-D Master List of Formulas and Symbology (2024)**
https://cdn.avixa.org/production/docs/default-source/default-document-library/ctsd_math_formulas_2024.pdf
9. **Vicom · Size Classroom Displays to the 2026 Standard (V202.01:2026 note)**
<https://www.vicom-corp.com/classroom-display-sizing-avixa-v202-01-2026/>
10. **AVIXA · Image System Contrast Ratio (V201.01)**
<https://www.avixa.org/resources/standards/image-system-contrast-ratio>
11. **Insight Media / Display Daily · contrast categories in the AVIXA contrast standard**
<https://www.insightmedia.info/infocomm-issues-draft-standard-for-contrast-on-direct-view-displays-but-is-it-right/>
12. **AVIXA · Audio Coverage Uniformity in Listener Areas (A102.01)**
<https://www.avixa.org/standards/audio-coverage-uniformity-in-listener-area>
13. **AVIXA · Rack Design for AV Systems (F502.02)**
<https://www.avixa.org/resources/standards/rack-design-for-audiovisual-systems>
14. **AVIXA · Cable Labeling for AV Systems (F501.01)**
<https://www.avixa.org/resources/standards/cable-labeling-for-av-systems>
15. **AVIXA · Recommended Practices for Security in Networked AV Systems (RP-C303.01)**
<https://www.avixa.org/standards/recommended-practices-for-security-in-networked-audiovisual-systems>
16. **2010 ADA Standards for Accessible Design (U.S. DOJ)**
<https://www.ada.gov/law-and-regs/design-standards/2010-stds/>
17. **2010 ADA Standards · Table 219.3 Receivers for Assistive Listening Systems**
<https://www.corada.com/documents/2010ADASTandards/219-3>
18. **2010 ADA Standards · 307.2 Protrusion Limits**
<https://www.corada.com/documents/2010ADASTandards/307-2>
19. **OSHA · 29 CFR 1926.1101 Asbestos (PACM definition)**
<https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1101>
20. **FCC · Wireless Microphones**
<https://www.fcc.gov/wireless/bureau-divisions/broadband-division/wireless-microphones>
21. **ASHRAE Handbook, HVAC Applications · Noise and Vibration Control**
https://handbook.ashrae.org/Handbooks/A23/IP/A23_Ch49/a23_ch49_ip.aspx
22. **AcousPlan · ASHRAE noise criteria by space type (summary)**
<https://acousplan.com/blog/ashrae-noise-criteria-hvac>

23. **Armstrong · Classroom Acoustics and ANSI/ASA S12.60**
<https://www.armstrong.com/en-us/articles/classroom-acoustics-ansi-standard.html>
24. **Audinate · How does Dante use DSCP values for QoS?**
<https://support.getdante.com/hc/en-gb/articles/5508296234399-How-does-Dante-use-DSCP-Diffserv-priority-values-when-configuring-QoS>
25. **Audinate · Networks and Switches (EEE, gigabit, QoS)**
<https://support.getdante.com/hc/en-gb/articles/5391517524127-Networks-and-Switches>
26. **Atlona · HDBaseT Cabling: A Guide**
<https://support.atlona.com/hc/en-us/articles/360054843994-HDBaseT-Cabling-A-Guide>
27. **Ethernet Alliance · Overview of IEEE 802.3bt Power over Ethernet**
https://ethernetalliance.org/wp-content/uploads/2019/12/WP_EA_Overview8023bt_V2p1_FINAL.pdf
28. **UL Standards & Engagement · How standards for wall and ceiling mounts help prevent injuries (UL 2442)**
<https://ulse.org/insight/ul-standards-engagement-standards-matter-how-standards-wall-and-ceiling-mounts-help-prevent-serious/>
29. **Strive AV · Meeting room lighting for video conferencing**
<https://striveav.com/faq/meeting-room-lighting/>
30. **Microsoft Learn · Meeting room guidance for Teams**
<https://learn.microsoft.com/en-us/microsoftteams/rooms/room-planning-guidance>

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