

SMART CLASSROOM PROJECTS · ENGINEERING SUPPORT

Smart Classroom Equipment List and Tender Specification Template

A complete equipment list for three deployment levels, plus paste-ready technical clauses for classroom, lecture hall and conference room tenders.

- Equipment list by deployment level — Essential, Standard, Advanced
- Clause library you can paste directly into a tender document
- The engineering reasoning behind each clause, so you can defend it
- Bidder qualification clauses that filter out box-shifters

Prepared for system integrators and project companies.

Guangzhou Tralltech Technology Co., Ltd. · Smart classroom and video conferencing system manufacturer since 2012.
tralltech.com · info@tralltech.com · Edition: August 2026

How to use this document

This document has two halves. **Part 1** is an equipment list you can use to scope a project and build a bill of materials. **Part 2** is a clause library — technical wording you can paste into the specification section of a tender or a client proposal.

Specifications are written before bids are submitted. Whoever writes the technical section shapes what every bidder must offer. If you are helping a school, ministry or employer prepare that section, these clauses give you defensible engineering wording instead of a copied product datasheet.

Three rules when you use these clauses

1. Write requirements, not model numbers.

A clause naming one manufacturer's model is usually disqualified as restrictive at evaluation. Every clause here is written as a performance or capability requirement.

2. Keep every clause defensible.

You should be able to explain, in one sentence, why each clause exists. The *Why it matters* note under each one gives you that sentence.

3. Fill in the brackets.

Square brackets [] mark values that depend on your room: seat counts, quantities, warranty periods. Replace them before you submit.

Not sure which clauses apply to your project? Send us the room list — how many rooms, what type, and roughly what budget — and we will return a project-specific version of this document, with your company name on the cover, within 24 hours. We work only through integrators and project companies, and we never contact your end client.

Part 1 — Equipment list by deployment level

Three levels cover almost every education project. Level 1 gets a room teaching; Level 2 adds capture and management; Level 3 adds one-to-one devices and campus-scale control. Use this to scope the BOM before pricing.

Component	Function in the system	L1	L2	L3
Interactive flat panel	Primary display and teaching surface. Sizes 55" to 110".	•	•	•
Digital podium	Teacher control position: touch screen, PC, connections, microphone mounts.	•	•	•
Wireless microphone	UHF voice lift for the presenter. Additional handheld channels for questions.	•	•	•
Active loudspeakers	Required because display and podium audio outputs are line-level.	•	•	•
Amplifier + passive speakers	Replaces active speakers in large or multi-zone rooms (lecture halls, halls).	opt	opt	•
Audio hub / processor	Mixing, delay, feedback suppression, and the clean feed for recording.	—	opt	•
PTZ camera	Recording, streaming and hybrid teaching. IP/NDI output for the recorder.	—	•	•
Document camera	Displays physical material. May be integrated within the digital podium.	—	•	•
OPS computing module	Runs Windows inside the panel where the curriculum requires it.	opt	opt	•
Device management (MDM)	Central control, policy enforcement and OTA updates across all rooms.	—	•	•
Student tablets + charging cart	One-to-one learning, managed and charged as a class set.	—	opt	•
Local content server	Serves lessons and content where internet is unreliable or absent.	—	opt	opt
Wireless access point	Room connectivity. Requires a PoE switch, supplied by the integrator.	opt	•	•
UPS backup power	Protects display, podium and rack equipment on unstable grids.	opt	opt	•
Mounts and stands	Wall mount or mobile floor stand, depending on room and reuse.	•	•	•

• included · opt optional / project-dependent · — not included at this level

The PoE network switch and structured cabling are normally supplied by the integrator and are not part of the equipment BOM above.

Part 2 — Tender specification clause library

Each clause below is written to be pasted into a tender or proposal. Under each one is the engineering reason it exists — use it if the clause is challenged during evaluation.

2.1 Interactive display

The display is where most tenders over-specify brightness and under-specify everything that actually determines whether the room works.

The interactive display shall be sized such that the furthest seat is no more than **six times the image height** from the screen. Where this cannot be achieved, additional repeater displays or projection shall be provided.

Why it matters: A 110-inch panel is about 1.37 m tall, giving a usable range of roughly 8 m. Rooms deeper than that leave the back rows unable to read the content, whatever the panel size.

The display shall provide **4K UHD (3840 x 2160)** resolution with multi-point capacitive or infrared touch and a touch response time of **[10] ms or better**.

Why it matters: Response time governs whether handwriting feels natural. It is rarely specified, and it is the single most common complaint after installation.

The display shall hold **Google EDLA certification (Enterprise Devices Licensing Agreement)**, providing licensed Google Mobile Services and access to Google Play for education applications.

Why it matters: EDLA is the only route to legitimate Google services on an Android display. Uncertified panels sideload, which breaks under updates and cannot be supported. This clause is a hard, verifiable gate that many suppliers cannot pass.

The audio output of the display shall be **line-level**; passive loudspeakers shall not be connected directly to it. Amplification shall be provided by active loudspeakers or a dedicated amplifier.

Why it matters: This single clause prevents the most frequent commissioning failure in classroom AV — passive speakers wired to a line-level output, producing almost no sound.

The display shall carry **CE, FCC and RoHS** certification, with documentation supplied for customs clearance and tender compliance.

Why it matters: Certification documents are usually required for import clearance, not just evaluation. Ask for them at bid stage, not at delivery.

2.2 Digital podium - core requirements

The podium is the teacher's control position, and the item most often omitted from a classroom BOM then added late at full price.

The podium shall integrate a **capacitive touch screen of [21.5] inches or larger** at 1920 x 1080 resolution, supporting **10-point touch** with a response time of **5 ms or better**.

Why it matters: An integrated screen lets the teacher drive the lesson without turning away from the class. Ten-point touch supports annotation and gesture zoom during teaching.

The podium shall provide **electric height adjustment over a range of not less than 90 cm to 110 cm**, operable by a single control.

Why it matters: Rooms are shared between teachers of different heights, and accessibility rules in many jurisdictions require an adjustable teaching position.

The podium shall be **mobile**, fitted with lockable castors permitting relocation between rooms without dismantling.

Why it matters: Mobility is what allows one podium to serve a hall, a training room and a demonstration classroom. Fixed lecterns cannot be redeployed.

The podium shall include an **integrated computing module** with an Intel Core i5 8th generation processor or better, **8 GB RAM, 512 GB storage** and Windows, with Wi-Fi and **two Gigabit Ethernet ports**.

Why it matters: Specifying the computer inside the podium prevents a separate desktop PC appearing on the floor after handover. Two network ports allow the teaching network and a management or campus network to stay separate.

The podium shall provide **not fewer than two HDMI inputs** for visiting laptops and auxiliary sources.

Why it matters: A single input forces cable-swapping during class. Guest presenters are the normal case in lecture halls and training rooms, not the exception.

The podium shall provide **RS232, RS485 and IR control ports** for integration with room control, display power management and third-party AV equipment.

Why it matters: Serial control is what turns a podium into a control position: one action powers the display, selects the source and sets the audio. Suppliers without a control-capable product cannot meet this clause.

The podium shall provide **adjustable microphone mounts**, a stylus, and a secure internal cable path with industrial-grade internal cabling.

Why it matters: Loose cables and unmounted microphones are the two most common causes of damage and support calls in shared teaching rooms.

2.3 Dual-screen podium and integrated subsystems

Use this section where the room needs a presenter position rather than a table: lecture halls, auditoriums, council chambers, training centres and demonstration classrooms.

The podium shall provide **dual displays** - an operator touch screen for the presenter and a front-facing display of **[43] inches Full HD** visible to the audience - with **independent outputs**, so presenter notes and controls remain private.

Why it matters: Standard practice in lecture halls: the audience sees the content, the presenter sees notes and controls. A single mirrored output cannot do this, and most lectern products cannot either.

The podium shall include an **integrated document camera** with **4K resolution, 10x optical zoom** and a capture area supporting **A3** originals.

Why it matters: An integrated unit removes a separate device, its cabling and its input from the room. A3 capture matters for textbooks, drawings and examination papers, which A4 units crop.

The podium shall include an **integrated amplifier of not less than 2 x 40 W** and a **UHF wireless handheld microphone with dual-antenna diversity reception**.

Why it matters: Diversity reception prevents dropouts as the presenter moves across a stage. An integrated amplifier also resolves the line-level problem in smaller rooms, since passive speakers can be driven directly from the podium.

The podium shall include an **IC card reader** for user authentication, permitting access control and attendance logging at the teaching position.

Why it matters: Card authentication is how shared rooms are protected against unauthorised use, and how teaching hours are logged in many ministry and university projects. Very few podium products offer it.

The podium chassis shall be **metal-coated cold-rolled steel with tempered glass of not less than 3.5 mm** on the working surface.

Why it matters: Teaching positions take daily physical use. Chassis construction is the difference between a five-year asset and a two-year one, and it costs nothing to specify.

The supplier shall confirm the ability to supply **customised podium configurations** - screen sizes, chassis form, colour and integrated subsystems - to suit the room.

Why it matters: Room dimensions, stage heights and existing furniture vary. A supplier who can only offer a catalogue model forces the room to fit the product.

2.4 Audio system

Audio decides whether a room is usable. It is also the section most often copied from a small-classroom template into a room four times the size.

In rooms up to approximately **[60] seats**, passive loudspeakers may be driven from the integrated podium amplifier. Above that, or in any multi-zone room, a **dedicated amplifier** shall be provided.

Why it matters: An integrated 2 x 40 W amplifier is correct for a classroom and undersized for a hall. Stating the threshold stops a classroom design being copied into a lecture hall.

The audio system shall provide even speech coverage across all seating positions, with **no seat more than [10] m from the nearest loudspeaker**.

Why it matters: Sound falls about 6 dB every time distance doubles. Coverage is a placement problem, not a power problem — one loud pair at the front cannot fix a deep room.

In rooms requiring six or more loudspeakers or long cable runs, loudspeakers shall be connected on a **100 V constant-voltage line** with individually selectable power taps.

Why it matters: Constant-voltage distribution tolerates long runs, allows per-speaker level balancing, and keeps the room compatible with any campus paging system added later.

Amplifier continuous output shall be not less than 1.5 times the total connected loudspeaker power.

Why it matters: Headroom prevents clipping on speech peaks. An amplifier run at its limit distorts and eventually damages the loudspeakers.

All loudspeaker zones located behind the primary zone shall be **individually delay-adjustable**.

Why it matters: Sound needs about 3 ms to travel one metre. Without delay, rear speakers arrive ahead of the presenter's voice and listeners hear the ceiling instead of the stage.

The system shall include not fewer than **[3] UHF wireless microphone channels** with frequency coordination, comprising **[1] presenter headset or lapel unit** and **[2] handheld units**.

Why it matters: 2.4 GHz microphones share their band with every Wi-Fi device in the room and drop out when the room fills. UHF with coordination is the only reliable multi-channel option.

The audio processor shall provide **automatic microphone mixing and feedback suppression** on all live channels.

Why it matters: Every doubling of simultaneously open microphones costs about 3 dB of gain before feedback. Automatic mixing closes unused channels and buys that margin back.

2.5 Camera, recording and hybrid teaching

Rooms above [120] seats shall be provided with **not fewer than two cameras** — one covering the presenter and one covering the audience — each with simultaneous **USB and IP/NDI output**.

Why it matters: Simultaneous outputs let the conferencing platform and the recorder take the same feed without contention or source switching.

The recording and conferencing audio feed shall be taken from the **audio processor line output**, and not from a camera microphone or an ambient room microphone.

Why it matters: A room microphone captures the reinforced sound coming back out of the loudspeakers, so remote participants receive a hollow, echoing signal that cannot be fixed afterwards.

Where hybrid teaching is required, in-room reinforcement and far-end call audio shall be **separate signal paths**, with echo cancellation applied to the call path.

Why it matters: Feeding one path into the other is what creates the echo loop remote students complain about. Separating them is a design decision, not a product feature.

2.6 Device management and security

This section is what separates a fleet that is still working in year three from one that is not.

Android devices supplied under this contract shall be **pre-enrolled in Device Owner mode at the factory**, with platform-signed management firmware installed before shipment.

Why it matters: Device Owner cannot reliably be applied in the field across hundreds of units. Factory pre-enrolment is only possible for a bidder with manufacturing control — it excludes resellers who simply forward boxes.

The management platform shall support **remote configuration, application whitelisting, policy enforcement and over-the-air (OTA) updates** across all supplied devices.

Why it matters: Without OTA, every future update is a site visit. On a multi-school rollout that cost exceeds the hardware saving that caused it.

Devices shall be **operational on delivery**, with the required launcher, applications and policies pre-installed; on-site software provisioning per unit shall not be required.

Why it matters: Per-unit provisioning is the hidden labour cost in every large deployment. Specify it away.

2.7 Low-connectivity and offline operation

Include this section for rural, donor-funded or infrastructure-limited sites.

The solution shall permit **teaching and content access without an internet connection**, using a local content server holding the curriculum content and serving devices over the local network.

Why it matters: Sites with unreliable connectivity cannot use cloud-only platforms. This clause excludes solutions that appear to work during a demonstration and fail in the field.

Content and learner progress shall **synchronise automatically** when connectivity becomes available, without manual intervention at each device.

Why it matters: Manual sync does not happen in practice. Automatic reconciliation is what makes offline deployments sustainable.

UPS backup power shall be provided for the display, podium and rack equipment, supporting not less than [15] minutes of operation.

Why it matters: On unstable grids, an unprotected shutdown mid-lesson is both a teaching loss and a long-term risk to the equipment.

2.8 Bidder qualification and after-sales

Technical scoring rarely separates bidders. These clauses do.

The bidder shall provide **manufacturer authorisation** for the equipment offered, together with evidence of the manufacturer's production capability.

Why it matters: This filters out trading companies who have no control over specification, lead time or spare parts.

The bidder shall supply, at bid stage, a **system topology diagram and complete bill of materials** demonstrating that the proposed equipment forms a working system.

Why it matters: A price list is not a design. Requiring topology at bid stage exposes bidders who have assembled a quotation item by item without checking that the parts connect.

Equipment shall carry a warranty of not less than **[2] years** from delivery, with **individual spare parts** available and a named technical contact for the duration.

Why it matters: Whole-unit replacement is impractical across borders. Spare-part availability is what keeps a fleet running in year three.

The bidder shall confirm the availability of **region-appropriate power and plug configurations** and complete export documentation.

Why it matters: Wrong plug types and missing documents are the most common cause of delayed customs clearance on education shipments.

Get a project-specific version

This is the general edition. Most projects need something narrower — the room types you are actually bidding, the quantities you are actually quoting, and the clauses that match your client's procurement rules.

Send us three things

Room list

How many rooms, and what type — standard classroom, lecture hall, computer lab, training room, conference room.

Project context

Country, whether it is a public tender or a direct award, and the submission date if there is one.

Rough budget band

Enough to choose between deployment levels. We do not need your client's name and we will not ask for it.

What you get back within 24 hours

- A bill of materials priced for your project
- A system topology diagram for each room type
- This clause library, filtered and filled in for your rooms
- The whole document under your company name and logo, ready to submit

We work only through system integrators and project companies. We do not sell to schools, ministries or end users, and we never contact your client. The project, the relationship and the margin stay with you. An NDA is available on request.

info@tralltech.com · tralltech.com/smart-classroom/ · +86 151 1298 7083

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This document is provided as a drafting aid. Values shown in square brackets must be adapted to the specific room, budget and procurement rules of your project. Edition: August 2026 · (c) Guangzhou Tralltech Technology Co., Ltd.