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Remote Proceedings Technology Recommendations (Final Draft)

Advancing the Hybrid Courtroom
Phase 2 Workstream



Judicial Council of California

Contents

ADVANCING THE HYBRID COURTROOM PHASE 2 WORKSTREAM MEMBERS	4
INTRODUCTION	6
Minimum Technology Standards	6
Guiding Principles	7
Areas of Focus	8
1. COURTROOM OPERATIONS	10
1.1. General Courtroom Operations Recommendations	10
1.2. Conferencing Platform Recommendations	12
2. AUDIO AND VIDEO	17
2.1. Core Technology Recommendations	17
2.5. Video Recommendations	22
2.6. Typical Equipment	23
Table A: Commonly used equipment brands	23
2.7. General Video Recommendations	23
3. DISPLAYS	25
3.1. Performance-Based Approach	25
3.2. Industry Standards	25
3.2.1. <i>DISCAS</i>	26
Table B. DISCAS quick reference chart	26
3.2.2. <i>AVIXA ISCR</i>	27
3.3. Application in a Typical Trial Courtroom	27
3.3.1. <i>Desktop displays</i>	27
3.3.2. <i>Front display for jurors</i>	27
3.3.3. <i>Public gallery</i>	27
3.3.4. <i>ISCR verification</i>	27
3.4. Minimum Required Displays	28
Table C. Minimum Required Displays	28
3.5 General Display Recommendations	28

4. INFRASTRUCTURE	29
4.1. Electrical Recommendations.....	29
4.2. Network Recommendations.....	30
4.3. Workstation Recommendations	31
4.4. Accessibility and ADA Compliance	31
4.5. Best Practices.....	31
5. COURTROOM LAYOUTS.....	33
5.1. Layout 1: Center Bench	34
5.2. Layout 2: Corner Bench.....	36
5.3. Layout 3: Large Trial—Center Bench.....	38
5.4. Layout 4: Double Jury—Center Bench.....	40
5.5. Layout 5: Double Jury—Corner Bench.....	42
5.6. Layout 6: Arraignment.....	44
5.7. Layout 7: Family Courtroom.....	46
APPENDIX A: RECOMMENDATION SUMMARY TABLES.....	48
Table 1. Summary of general courtroom operations recommendations.....	48
Table 2. Summary of conferencing platform recommendations.....	48
Table 3. Summary of remote proceedings documentation recommendations.....	49
Table 4. Summary of core technology recommendations	50
Table 5. Summary of microphone location recommendations	51
Table 6: Summary of speaker location recommendations	51
Table 7: Summary of speaker recommendations	52
Table 8. Summary of display recommendations.....	53
Table 9. Summary of electrical recommendations.....	53
Table 10. Summary of network recommendations.....	54
Table 11. Summary of courtroom technology management best practices and recommendations	54
APPENDIX B: PARTICIPANT CHECKLIST FOR JUDICIAL COUNCIL MINIMUM TECHNOLOGY REQUIREMENTS FOR REMOTE PROCEEDINGS.....	55
Judicial Officers.....	55
Court Staff.....	55

Court Reporters	56
Court Interpreters	56
Remote Participants	57
Parties, Attorneys, Witnesses, and Jurors	57
APPENDIX C: REFERENCES	58
APPENDIX D: COURTROOM TECHNOLOGY COMPLIANCE AND FACILITIES GUIDANCE	59
Department of Industrial Relations	59
Hazardous Materials Considerations	59
Building Permit and Inspection Requirements	59
Court-Funded Facilities Request	60
Ongoing Maintenance	60
APPENDIX E: PROJECT PLANNING AND BUDGETING	61

Advancing the Hybrid Courtroom Phase 2 Workstream Members

Name	Title	Court	Role
Hon. Samantha P. Jessner	Judge	Superior Court of Los Angeles County	Executive Sponsor
Mr. AJ Guzman	Chief Information Officer Director of IT & Facilities	Superior Court of Sutter County	Executive Co-sponsor
Mr. Jordan Aiken	Chief Information Officer	Superior Court of Kern County	Member
Hon. Rebecca Connolly	Judge	Superior Court of Santa Cruz County	Member
Mr. Tim Cool	Chief Deputy of Information Technology	Superior Court of Riverside County	Member
Hon. Sean Dabel	Judge	Superior Court of San Mateo County	Member
Mr. Dorian Deyeth	Senior Court Systems Administrator	Court of Appeal, Second Appellate District	Member
Hon. Charles H. Ervin	Presiding Judge	Superior Court of Sierra County	Member
Mr. Jason B. Galkin	Court Executive Officer	Superior Court of Riverside County	Member
Ms. Anaruth Gonzalez	Director of Courtroom Support	Superior Court of Los Angeles County	Member
Hon. Michael S. Groch	Presiding Judge	Superior Court of San Diego County	Member
Mr. Kevin Halton	Systems Administrator	Superior Court of Monterey County	Member
Ms. Michelle Jeremiah	Director of Operations	Superior Court of Sacramento County	Member
Hon. Kimberly Menninger	Judge	Superior Court of Orange County	Member
Mr. Luis Olachea	Deputy Chief Information Officer for Infrastructure and Support	Superior Court of Los Angeles County	Member
Ms. Shannon Pedotti	Court Executive Officer	Superior Court of Sierra County	Member
Ms. Taylor Perry	User Support Supervisor	Superior Court of Orange County	Member
Mr. Marcos Prado	IT Infrastructure Manager	Superior Court of San Mateo County	Member
Mr. Mike Sorensen	Information Technology Project Manager	Superior Court of San Diego County	Member
Mr. Drew Taylor	Information Technology Manager	Superior Court of Sacramento County	Member
Mr. Osvaldo Vazquez-Torres	Information Technology Systems Engineer	Superior Court of San Diego County	Member
Mr. Jason Zigelhofer	Infrastructure Administrator	Superior Court of Santa Cruz County	Member

Workstream Staff

Name	Title	Organization	Role
Mr. John Yee	Chief Information Officer	Judicial Council Information Technology	Senior Leadership
Mr. Andrae Randolph	Deputy Chief Information Officer	Judicial Council Information Technology	Business Lead
Ms. Kackie Cohen	Information Technology Architect	Judicial Council Information Technology	Project Manager
Mr. David Scott	Information Systems Supervisor	Judicial Council Information Technology	Subject Matter Expert
Ms. Jamel Jones	IT Manager	Judicial Council Information Technology	Program Management
Ms. Jessica Craven Goldstein	Information Systems Supervisor II	Judicial Council Information Technology	Program Management
Ms. Laura Brown	Sr. Business Systems Analyst	Judicial Council Information Technology	Program Management

Introduction

The Information Technology Advisory Committee (ITAC) is pleased to present this guide to support California courts in selecting and implementing technology intended to effectuate and support remote courtroom proceedings. This initiative directly advances the goal outlined in the *Tactical Plan for Technology 2025–2026*, to create and annually update a technology playbook addressing equipment needs and implementation within courtrooms to enable remote proceedings in accordance with the Judicial Council Minimum Technology Standards for Remote Proceedings¹ and Senate Bill 133 (Stats. 2023, ch. 34). ITAC included the initiative in its 2025 Annual Agenda, with the added recommendation that the resulting standards be referenced in the *California Trial Court Facilities Standards*. This guide will be updated on an annual basis to ensure continued relevance and alignment with technological advancements and evolving judicial needs.

To carry out this directive, the Advancing the Hybrid Courtroom Phase 2 Workstream was created to conduct the necessary research and develop this guide. Building upon the foundational work of Phase 1, the workstream’s leaders and members undertook a comprehensive analysis to identify and recommend infrastructure and procedural components for consistent and meaningful participation in courtroom proceedings, regardless of whether participants appear in person or remotely.

ITAC extends its sincere appreciation to the workstream for its dedicated efforts in fulfilling this branchwide objective and contributing meaningfully to the modernization of courtroom operations across the state with the goal of advancing due process and access to justice.

Minimum Technology Standards

The Judicial Council’s Minimum Technology Standards for Remote Proceedings establish functional requirements that describe what courtroom technology must accomplish rather than prescribe specific hardware or configurations. The standards in that document outline the essential capabilities—such as enabling participants to see and hear one another, providing reliable connectivity, and ensuring judicial control over remote participation—without dictating the exact type, quantity, or placement of devices such as cameras, microphones, or speakers. This descriptive approach focuses on outcomes, allowing courts to have flexibility in selecting solutions that meet their unique operational needs and budget realities while complying with statutory requirements.

In contrast, prescriptive requirements would mandate specific equipment quantities, installation locations, or technical specifications. By adopting a descriptive framework, the Judicial Council ensures courts can implement technology that satisfies functional goals—such as clear audio, visual identification of speakers, access to an interpreter, and secure remote access—while

¹ Minimum Technology Standards for Remote Proceedings (SB 133) (adopted by the Judicial Council of California, effective Apr. 1, 2024), courts.ca.gov/system/files/file/minimum-technology-standards-20240401.pdf

accommodating variations in courtroom size, budget, and infrastructure. This flexibility supports scalability and innovation, enabling courts to meet evolving standards without being constrained by rigid technical mandates.

This document, *Remote Proceedings Technology Recommendations*, is designed to bridge the gap between descriptive and prescriptive requirements. It offers a practical architecture for hybrid courtrooms, including schematic diagrams and functional descriptions that can be adapted to meet specific court needs. The goal is to provide courts with actionable guidance on equipment selection, best practices, and implementation details necessary to meet—and potentially exceed—the minimum standards.

By presenting recommendations and design considerations, this resource helps courts translate functional requirements into effective, real-world solutions that enhance reliability, accessibility, procedural integrity, and access to justice, without mandating a specific course of action. The recommendations are intentionally descriptive and do not mandate any specific technology, vendor solution, or protocol. Courts retain flexibility to use alternative technologies that meet functional goals. Implementation of the recommendations is also dependent on local resources, and each court may determine what is feasible based on available funding. The workstream recognizes that budget limitations may affect the ability to undertake certain recommendations.

Further, these recommendations do not trigger an expectation that courts review their existing remote proceedings technology. This document is provided for use as practical reference; it is not a directive to undertake any action.

For an optimal remote experience, participants should be able to both see and hear each other and the proceedings. However, the workstream acknowledges that some remote participants may lack the bandwidth or capability for video. While the guide assumes participants can see and be seen, the inability to appear via video and participate using audio only is not considered detrimental to remote participation, unless the court orders the proceedings to be conducted using video, or as required or allowed by statute.

The workstream also recognizes that in order for courts in California to adopt and implement innovation, especially technology innovation, they must receive adequate funding to enable them to do so.

Guiding Principles

The foundation of this document is a set of guiding principles focused on flexibility and scalability. These principles ensure that technology solutions not only meet current needs but also anticipate future demands, supporting equitable access, judicial integrity, operational efficiency, flexibility, and access to justice.

Principle 1: Focus on reasonably equitable access

Recognize that in-person and remote experiences differ and courts must strive to minimize disparities. The goal is to create a user experience that provides easy and meaningful access for all participants, whether physically present or remote, that is not prejudicial to any party.

Principle 2: Preserve judicial decorum

Courtroom technology should not detract from the dignity and formality of judicial proceedings. Maintaining decorum in both physical and remote environments requires thoughtful placement of equipment, unobtrusive designs, and protocols that uphold the authority of the court and protect the dignity and formality of court proceedings while enabling modern access and functionality.

Principle 3: Future-proof infrastructure

Courtroom systems and infrastructure should be designed with adaptability in mind. Technology evolves rapidly, and planning for future needs reduces costly retrofits and disruptions. Scalable solutions, modular components, and standards-based designs ensure that courts can integrate new capabilities without overhauling existing systems.

Principle 4: Standards-based approach

The recommendations in this document align with the Judicial Council's Minimum Technology Standards for Remote Proceedings. The Minimum Technology Standards define functional requirements rather than prescribe specific hardware, providing courts with flexibility while ensuring compliance with minimum technology standards. This approach promotes consistency while supporting innovation and recognizes the speed at which technology innovation changes.

Principle 5: Accurate capture of the record

Technology must facilitate the accurate capture of court proceedings, including both minutes and, where applicable, the creation of a verbatim record of the proceedings. Systems should be reliable, provide redundancy, and include clear protocols for monitoring and verifying the creation of a verbatim record of the proceedings.

Areas of Focus

The recommendations in this document are organized into key focus areas, each addressing critical components of a hybrid courtroom.

Courtroom operations

This section addresses the processes and technologies that tie together all components of a hybrid courtroom. It includes video conferencing platforms, capture of a verbatim record, interpreting, and evidence presentation systems, ensuring smooth integration and procedural integrity.

Audio and video

Guidance is provided for cameras, microphones, and speakers, including placement strategies and technical specifications. This section also covers sound and video processing equipment and streaming capabilities to ensure clarity and reliability for all participants.

Displays

Best practices are given for selecting and positioning monitors, projectors, and screens so that participants, both in person and remote, can view proceedings and evidence. Proper display placement supports engagement and accessibility.

Infrastructure

Guidance is provided for foundational elements such as network connectivity, electrical power, and physical readiness of the courtroom. This section emphasizes planning for future capacity and capabilities, ensuring that infrastructure supports evolving technology requirements and realities.

1. Courtroom Operations

Thorough planning and consideration of the nature of the court proceedings that also recognizes courts' operational requirements will ensure that remote technologies support reasonably equitable and meaningful participation by all parties, uphold judicial decorum, and accurately capture the official record of the court and the verbatim record of the hearing.

This section outlines key functional and operational considerations that, while not specifically technical in nature, offer practical and actionable guidance to court staff on managing hybrid proceedings with clarity, efficiency, and equitable access for both in-person and remote participants. As previously noted, the guide assumes that all participants will not only be able to hear and be heard but will also be able to see and be seen. However, the inability of a remote participant to appear via video and appear only via audio is not detrimental to remote participation, unless the court orders the proceeding to be conducted using video or as required or allowed by statute.

Please note that throughout this document, the auxiliary word “should” indicates a recommendation, not a mandatory requirement.²

1.1. General Courtroom Operations Recommendations

The following recommendations for general operations support the effective delivery of remote and hybrid proceedings.

1.1.1. *Efficient workspaces*

Consider operational efficiency when determining placement of equipment and various displays managed by judicial officers and court staff.

1.1.2. *Unobstructed judicial view*

Minimize any obstruction caused by courtroom equipment. Ensure that technology installations do not block the judicial officer's line of sight or interfere with courtroom visibility, decorum, or security. Recommendations include:

- Map sightlines before installing audiovisual equipment.
- Use low-profile and adjustable mounts and cable management solutions.
- Incorporate opinions and expertise of judicial security personnel.

1.1.3. *Juror display visibility*

Position monitors and screens to ensure jurors have a clear, unobstructed view of all relevant materials. Confirm compliance with Americans with Disability Act (ADA) standards.

² <https://www.ietf.org/rfc/rfc2119.txt>

1.1.4. Interpreter audio

When feasible, configure the audio system so that only the interpreter's English rendition is transmitted in courtroom audio feeds. This aids in capturing a verbatim record of the proceedings. Consider the following actions:

- Test interpreter audio during pre-hearing checks.
- Train staff on managing audio feeds for interpretation.

1.1.5. Electronic recording status

Ensure that the status of electronic recording equipment (i.e., on or off) is clearly visible and easily available for operation by designated court personnel or the judicial officer.

1.1.6. Remote staff connectivity

Establish clear connection protocols for court staff who need to appear remotely. Consider the technical requirements necessary to support remote services that may need to connect a single remote station to multiple courtrooms, including:

- Remote electronic monitoring;
- Electronic recording;
- Remote court reporting;
- Remote court interpreting; and
- Livestreaming.

The following are actions to consider:

- Define bandwidth and hardware requirements for remote staff stations.
- Implement secure authentication for remote access.
- Document steps for troubleshooting common remote issues.

1.1.7. Training and support

Provide training and ongoing support—both internally for court staff and externally for stakeholders—to ensure a full understanding of the courts' modern courtroom operations and technology systems.

1.1.8. Internet access

Adopt a standard for high-speed wireless access for guests and court users.

1.1.9. Shared microphones

Develop a protocol outlining how participants should communicate when individual microphones are not available.

1.1.10. Handling technical issues

Develop a protocol to address connectivity problems that impact interpretation, verbatim record capture, or audibility. The protocol should:

- Ensure staff availability for real-time troubleshooting;
- Include clear escalation steps for unresolved issues; and
- Provide publicly accessible guidance on the courts' websites for common remote participant problems (e.g., audio/video setup, bandwidth limitations).

1.1.11. Remote participants and observers

Consider limiting active participation in remote proceedings to essential participants, such as judges, attorneys, witnesses, parties/litigants, and interpreters, to simplify conference management and maintain security. Courts may need to accommodate scenarios where non-participants, such as non-party participants, media representatives, or members of the public, require remote access as observers. When courthouses are physically closed, Assembly Bill 716 (Stats. 2021, ch. 526) requires courts to provide at least an audio stream or telephonic access to ensure public access to proceedings.³ Using video streams or audio-only access will enable remote observers to see or hear the proceedings without direct interaction with essential participants.

Recommendations include:

- Define eligibility criteria for remote participation and observation.
- Update courtroom scheduling systems to reflect remote roles.
- Communicate participation limits in advance notices.
- Implement technology to permit audio/video observation-only access.
- Configure privacy and security safeguards for observer access.
- Provide information regarding public remote access on the court's website.

1.1.12. Identify verification

Consider establishing requirements for participants to identify themselves before proceedings begin, with notice that failure to do so may result in an incomplete court record and they may be barred from participation.

1.1.13. Notice of electronic monitoring

If necessary, develop a protocol for compliance with Government Code section 69957, which requires notice to litigants if electronic recording is used to monitor the performance of subordinate judicial officers.

1.2. Conferencing Platform Recommendations

To ensure remote and hybrid courtroom proceedings are conducted efficiently and with procedural integrity, courts may consider implementing a range of features, protocols, and best practices to enhance the functionality of their conferencing platforms. The following

³ Assembly Bill 716, legiscan.com/CA/text/AB716/id/2435936

recommendations are designed to support judicial officers, courtroom staff, and participants in maintaining order, visibility, and accurate records during remote hearings.

1.2.1. Speaker prioritization

Enable platform features that automatically prioritize or highlight the active speaker. This ensures participants can easily follow the dialogue and reduces confusion during multi-participant interactions. Consider these actions:

- Confirm that the platform supports active-speaker highlighting and enable it in settings.
- Test speaker prioritization during prehearing checks to ensure functionality.
- Ensure courtroom staff are trained on how to adjust speaker-view settings during proceedings.
- Document fallback procedures if speaker prioritization fails (e.g., manual spotlighting).

1.2.2. Camera configuration and pinning

Configure camera views to maintain consistent visibility of key participants. Allow “pinning” of critical roles such as the judicial officer, witness, or attorneys so they remain prominently displayed throughout the hearing. Actionable recommendations include:

- Verify that pinning functionality is available and enabled on the platform.
- Create a standard list of participants to pin (e.g., judicial officers, witnesses).
- Train staff on pinning and spotlighting features for smooth transitions.
- Test camera layouts before hearings to ensure visibility for all participants.

1.2.3. Chat visibility settings

Establish whether chat can be seen by the host or cohost, especially when the host or cohost includes the judicial officer. Consider the following actions:

- Review platform chat settings and configure visibility according to court policy.
- Train hosts and cohosts on monitoring and managing chat during hearings.
- Document protocols for disabling or archiving chat when required for recordkeeping or data retention policies.

1.2.4. Participant identification

To ensure an accurate record of the proceedings, courts must establish clear protocols and mechanisms that verify and maintain the identity of all participants throughout the hearing. Consider the following:

- Ensure courtroom clerks can identify each participant for inclusion in the official record of the hearing.
- Develop a protocol or mechanism to identify each participant each time they address the court for inclusion in the verbatim record.
- Adopt a protocol requiring participants to display their full names upon login to facilitate proper identification and recordkeeping. Participants’ names should be displayed at all times.

- Use conferencing platform tools to label participants or update display information after they join a hearing, ensuring clarity for all attendees.
- Establish procedures for identifying late registrants and ensure they are clearly marked in appearance reports accessible to courtroom clerks.

1.2.5. Judicial control over participation

Ensure the conferencing platform provides judicial officers and designated courtroom staff with robust controls to maintain order during proceedings. These controls should include the ability to mute participants, disable video feeds, or remove individuals from the session in response to disruptive behavior, as directed by the judicial officer. Suggested actions include:

- Verify that platform settings allow hosts and cohosts to mute audio and video feeds.
- Test participant removal functionality prior to live hearings.
- Assign a trained cohost to manage disruptive behavior promptly.
- Document procedures for judicial officers to direct staff actions during disruptions.

1.2.6. Entry and reentry controls

Implement features that allow participants to be moved to and from a virtual lobby, enabling controlled reentry when appropriate to maintain courtroom flow and security. The platform should also provide the ability to block entry or reentry using tools such as a virtual lobby or gallery, managed by the host or cohost, to prevent unauthorized access. Recommendations include:

- Configure virtual lobby settings for all remote hearings.
- Establish protocols for admitting participants only after identity verification.
- Train staff on blocking unauthorized reentry using platform controls.
- Test lobby management features during prehearing checks.

1.2.7. Confidential breakout sessions

Enable secure breakout rooms for private or confidential discussions, such as sidebars, without compromising the integrity of the main hearing. These rooms should ensure confidentiality, prevent unauthorized entry, and allow seamless return to the primary session when discussions conclude. Additional actions to consider include:

- Confirm that breakout rooms are password protected or host controlled.
- Test breakout room functionality before hearings to ensure smooth transitions.
- Assign a cohost to monitor breakout sessions for security compliance.
- Document procedures to move participants back to the main session promptly.

1.2.8. Remote evidence presentation

Courts should proactively plan for the presentation and management of digital evidence, particularly in situations where remote evidentiary hearings are authorized.

- Consider requiring remote participants to have sufficient technology to view and submit evidentiary materials and exhibits, ensuring full participation in the hearing.

- Establish protocols for presenting evidence remotely, recognizing that litigants may need to share videos, photographs, diagrams, maps, or other materials. These may carry evidentiary or nonevidentiary value and could require annotation or markings by witnesses or attorneys.
- Where available in the courtroom, provide remote participants with access to real-time document annotation tools to maintain parity in evidentiary review and interaction.

1.2.9. Remote Proceedings Documentation Recommendations

Courts should adopt and publish best practices to assist the public, court staff, and judicial officers in managing and participating in remote hearings while ensuring accurate capture of the verbatim record. Published guidance should clearly outline what participants can expect when engaging in hearings that accommodate both in-person and remote appearances. The following areas and recommendations provide practical, actionable guidance.

1.2.10. Technology in the physical courtroom

Information about available courtroom technology should be published and easily accessible to enable attorneys and participants to prepare in advance. Recommendations include:

- Provide information about the availability of microphones and displays at counsel tables.
- Outline evidence presentation equipment and operational instructions.
- Indicate availability of internet or Wi-Fi in the courtroom.
- Provide court contact information for technical support.
- Include diagrams or photos showing equipment placement for clarity.
- Provide specifications for supported file formats for evidence presentation.
- Include instructions for connecting personal devices to courtroom systems.

1.2.11. Remote appearance technology requirements

Courts should clearly communicate the technology requirements for remote participation. Recommendations include:

- Identify supported conferencing platforms and download instructions.
- Explain registration procedures for remote appearances.
- Provide instructions for equipment testing prior to the hearing.
- List court contact information for technical support.
- Publish minimum bandwidth and device specifications for remote participants.
- Provide guidance on using virtual backgrounds or camera positioning to maintain decorum.
- Offer troubleshooting steps for common connectivity issues.

1.2.12. Describe what participants can expect

Published information should also include what participants can expect when joining hearings that include both in-person and remote appearances.

- Identify staff who may participate remotely (e.g., interpreters, court reporters).

- State whether proceedings are electronically recorded.
- Include notice that under California Rules of Court, rule 1.150, recording is prohibited without permission.
- Describe equipment available for digital evidence presentation and protocols for remote access to exhibits.
- Specify equipment available or needed for remote interpretation.
- Explain protocols for muting/unmuting and speaking order during remote sessions.
- Provide instructions for submitting exhibits electronically before the hearing.
- Outline contingency plans for technical failures.
- Include etiquette guidelines for remote participants (e.g., dress code, controlling background noise).

2. Audio and Video

Audiovisual equipment such as cameras, speakers, and microphones are key components of a modern courtroom. These systems ensure that participants, whether attending in person or remotely, can clearly hear and see the proceedings as required or allowed by statute.

High-quality audio and video technologies also facilitate the accurate capture of the official and verbatim record, enable real-time interpretation, and support the presentation of digital evidence.

This section provides overarching guidance on best practices for courtroom audio and video technology, including recommendations for equipment types and placement strategies. Because each courthouse and courtroom has unique architectural and operational considerations, this document does not prescribe one-size-fits-all solutions. Instead, it outlines recommendations for hybrid proceedings and provides scalable options for courts seeking more advanced audiovisual technology.

As noted elsewhere in this document, an optimal remote experience requires that participants can both see and hear each other and the proceedings. Both phases of the Advancing the Hybrid Courtroom Workstream acknowledge, however, that some remote participants may lack the bandwidth or capability for video. While this guide assumes participants will generally be able to see and be seen, the inability of a remote participant to appear via video and participate using audio only is not considered detrimental to remote participation, unless the court orders the proceeding to be conducted using video, or as required or allowed by statute.

2.1. Core Technology Recommendations

The backbone of a modern courtroom audiovisual system consists of a control system, an audio digital signal processor (DSP), and an amplifier. These components ensure ease of use, reliable functionality, and high-quality audio and video performance. Remote-enabled courtrooms generally rely on this core equipment.

2.1.1. Audiovisual control system

An audiovisual control system enables centralized management of multiple technologies, including microphones, speakers, video displays, recording equipment, and lighting, through an intuitive interface such as a touch panel. Consider the following actions:

- Select a control system that supports customizable presets for common courtroom scenarios (e.g., arraignment, jury trial, remote hearing).
- Ensure the interface is user-friendly for judicial officers and clerks, with clear labeling for microphone activation, video switching, and evidence display.
- Integrate security features such as role-based access to prevent unauthorized changes.
- Provide training sessions for staff on using the control panel effectively.

2.1.2. Audio DSP

The DSP processes audio signals to eliminate background noise, manage microphone levels, and provide echo cancellation—critical for recordings and remote participation. Recommendations include:

- Configure DSP settings for automatic gain control to maintain consistent audio levels.
- Enable noise suppression and echo cancellation for hybrid hearings to improve clarity.
- Include remote monitoring capability so technical staff can adjust DSP settings during proceedings if needed.

2.1.3. Amplifier

Amplifiers power the courtroom’s speaker system, ensuring speech from microphones is loud and clear for all areas, including the gallery jury box, and judge’s bench. They are essential for large or acoustically challenging spaces. Recommendations include:

- Choose amplifiers sized appropriately for the courtroom’s acoustics and speaker layout.
- Schedule regular maintenance and load testing to confirm consistent performance.

2.1.4. Audio balancing (mix-minus) recommendation

All audio systems should support mix-minus audio balancing to manage multiple sources, prevent feedback loops, and ensure clear sound for all participants. This is particularly important in hybrid environments where remote and in-person audio streams must be synchronized and balanced. Consider these important actions:

- Implement dedicated audio routing for remote participants to avoid echo and feedback.
- Test mix-minus configurations during system setup and periodically thereafter.
- Document the audio routing plan for quick troubleshooting.

2.2. Protocol considerations

The Digital Audio Network Through Ethernet (Dante) protocol is strongly recommended for courtroom microphones and speakers because of its wide industry support, robust input/output capabilities, and flexibility. Dante enables daisy chaining of audio devices, reducing the need for multiple dedicated connection lines. Daisy chaining is a method of connecting devices in sequence, where each device links directly to the next rather than individually connecting to a central hub. This approach minimizes the number of required network switch ports and physical cable runs, simplifying implementation while reducing overall installation and maintenance costs. Recommendations include:

- Specify Dante-enabled devices in procurement documents.
- Configure virtual local area networks (VLANs) for Dante traffic to ensure network stability.
- Train IT staff on Dante Controller software for device management.
- Document daisy-chain topology for troubleshooting and scalability.

Conversely, courts should avoid adopting the Audio Video Bridging (AVB) protocol in new or upgraded environments. Because it requires specialized AVB-compatible network switches, the protocol can limit scalability and flexibility. In contrast, Dante operates over standard Ethernet switches, making it easier to integrate with existing network infrastructure and future-proof the system.

2.3. Microphone Recommendations

Clear and reliable audio is essential for effective courtroom proceedings, whether participants are present in person or joining remotely. Proper microphone placement and connectivity strategies ensure every voice is heard, minimize installation complexity, and maintain system performance.

2.3.1. *Minimum microphone requirements*

To meet the Judicial Council's Minimum Technology Standards for Remote Proceedings and comply with SB 133, microphones must have a mute or off function, and be installed in a manner that enables the following participants to hear and be heard by each other:

- Judicial officers;
- Court staff;
- Parties;
- Attorneys;
- Witnesses;
- Jurors;
- Court reporters; and
- Court interpreters.

2.3.2. *Recommended microphone locations*

Specific placement of microphones can enhance courtroom audio coverage for a more robust setup. These recommendations exceed minimum requirements and can be omitted if budget or architectural constraints exist.

- Judge: one microphone;
- Witness: one microphone;
- Lectern/podium: one microphone (wireless option may be considered based on courtroom layout);
- Counsel tables: minimum of two microphones per table;
- Court reporter: one microphone;
- Court interpreter: one microphone;
- Sidebar area: one microphone;
- Jury box: one microphone (overhead or half-wall mount, depending on layout and cable pathways);
- Clerk station: one microphone;
- Bailiff station: wireless option as needed;
- Audience area: for public remarks or overflow participation;
- Evidence presentation station: dedicated microphone for clarity during exhibit review;

- Wireless microphones: for flexibility during movement or special circumstances; and
- Lapel microphones: for judicial officers or presenters requiring mobility.

2.3.3. Microphone considerations

Beyond determining the number and placement of microphones, several additional measures can help achieve the highest audio quality. Consider implementing the following:

- Use directional microphones to reduce background noise and improve clarity.
- Test placement to confirm coverage and audibility.
- Implement wired connections for critical microphones to ensure stability.
- Verify compatibility with existing DSP and audiovisual control systems before installation.
- Conduct regular audio checks.
- Maintain backup microphones and cables to ensure continuity in the event of a failure.
- Document microphone management procedures for hybrid hearings.
- Establish a quick-response protocol for addressing audio issues during proceedings.

Key areas for microphone placement include the bench, witness stand, counsel tables, jury box, gallery, and lectern. Each location should ensure clear audio capture for in-person participants and seamless integration with remote systems.

Consideration should be given to the courtroom clerk, who plays a critical role in managing proceedings and must be able to communicate effectively with participants both in the courtroom and those appearing remotely. Providing a dedicated microphone for the clerk helps maintain clarity and supports hybrid hearing environments.

2.3.4. Connectivity tip

Use daisy-chaining to reduce cabling complexity. When microphones and endpoints support Dante or similar networked audio, chaining devices can simplify runs without compromising signal quality.

- Connect a single network cable to serve both the judge's and witness-stand microphones.
- Share one network connection for counsel-table and the lectern microphones.
- Daisy-chain the clerk's microphone from judge and witness-stand microphones.

Bailiff station and jury box ceiling-mounted microphones typically require dedicated lines.

2.4. Speaker Recommendations

This section covers key considerations for speaker placement, room acoustics, and audio protocols to ensure optimal sound quality and system reliability.

2.4.1. Minimum required speakers

To meet the Judicial Council's Minimum Technology Standards for Remote Proceedings and comply with SB 133, speakers must be installed in a manner that enables these participants to hear and be heard by each other:

- Judicial officers;
- Court staff;
- Parties;
- Attorneys;
- Witnesses;
- Jurors;
- Court reporters; and
- Court interpreters.

2.4.2. Speaker recommendations

Placement of speakers in specific locations can improve the experience of participants in the courtroom. It is recommended that in-person participants have a dedicated speaker in their area of the courtroom.

While a speaker in the audience area is not mandated by statute, it is regarded as a key component for ensuring optimal experience for individuals in the courtroom gallery.

2.4.3. Speaker considerations

Ceiling-mounted speakers are generally preferred because they deliver superior acoustic coverage while maintaining a clean, unobtrusive courtroom aesthetic. These speakers should support serial connectivity, either through traditional speaker cabling or Dante-enabled network connections for streamlined integration with modern audio systems. Recommendations include:

- Select ceiling-mounted speakers with wide dispersion for uniform coverage.
- Ensure speakers support Dante protocol or traditional cabling for flexibility.
- Verify mounting hardware compatibility with courtroom ceiling structure.
- Document speaker placement in design plans to avoid visual obstructions.

When ceiling speakers are not practical due to structural limitations or budget constraints, consider using combination speaker/microphone bases at key locations. These units provide both audio output and input functionality, ensuring clear sound distribution and effective voice capture without compromising system performance.

- Identify key locations (bench, witness stand, counsel tables) for combination units.
- Confirm microphone sensitivity and speaker wattage meet courtroom standards.
- Test integration with existing DSP systems.
- Include redundancy plans for critical audio points.

2.4.4. Room acoustics

Acoustic treatment should be an integral part of courtroom design to ensure speech clarity and minimize reverberation. Echo control must be carefully assessed, particularly in spaces with hard surfaces or high ceilings, as excessive sound reflections can degrade audio quality for both in-person and remote participants. This evaluation should include remote audio integration

strategies, latency management, and reliable audio bridging methods to maintain synchronization across all endpoints. Consider the following actions:

- Conduct an acoustic analysis before installation.
- Install absorptive panels on walls and ceilings where feasible.
- Implement DSP-based echo cancellation for remote audio feeds.
- Validate latency performance during hybrid session simulations.

Periodic sound-quality audits are strongly recommended to identify issues such as uneven coverage, feedback, or signal delays. These audits help verify that acoustic treatments remain effective over time, and that system adjustments, such as equalization or DSP tuning, are properly calibrated. Incorporating these practices ensures consistent, intelligible audio for hybrid courtroom environments. Recommended actions include:

- Schedule quarterly sound audits with certified audio technicians.
- Maintain logs of DSP settings and calibration changes.
- Use test tones and speech intelligibility metrics during audits.
- Update acoustic treatments as needed based on audit findings.

2.5. Video Recommendations

Clear and reliable video is essential for enabling accurate visibility for both in-person and remote participants. This section outlines best practices for camera placement, connectivity, and infrastructure planning to ensure high-quality video capture and long-term system flexibility.

2.5.1. *Minimum required cameras*

Minimum Technology Standards for Remote Proceedings (SB 133) states courtroom technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute. Specific placement and quantity of cameras is not mandated.

2.5.2. *Recommended cameras*

Cameras should be installed in the following locations:

- Two cameras behind the judicial officer to capture both counsel tables; and
- Two cameras behind the counsel tables to provide coverage of the judge and witness stand.

This configuration ensures comprehensive visibility of all key participants without obstructing the courtroom layout. See the [Courtroom Layouts](#) section for recommendations for typical courtroom designs. Wall-mounted cameras are recommended to preserve valuable counter and desktop space, particularly in courtrooms with limited space.

It is important to consider whether a court needs additional cameras for specific scenarios, such as positioning a camera to capture a view of the jury box or the dock.

2.5.3. Additional cameras

While additional cameras beyond the minimum requirements provide broader video coverage and support a more comprehensive courtroom setup, they may be omitted when budget or architectural constraints limit what can be installed. See the [Courtroom Layouts](#) section for recommendations.

2.5.4. Camera and protocol considerations

The choice of camera depends on the courtroom size and layout. Pan-tilt-zoom (PTZ) cameras are generally recommended for their flexibility and wide coverage capabilities. These types of cameras, by nature of their design, may require additional maintenance and support over their service life. Courts choosing to utilize PTZ cameras should implement a protocol for ensuring that any maintenance needs do not impact courtroom operations. Wall-mounted cameras are recommended to preserve valuable counter and desktop space. For video transport, the Network Device Interface (NDI) protocol is preferred due to its broad industry support, low-latency performance, and flexible input/output capabilities, making it ideal for hybrid proceedings and streaming environments.

2.6. Typical Equipment

The table below provides examples of commonly used courtroom equipment brands. It does not prescribe specific manufacturers or brands and is not exhaustive. Rather, it serves as a starting point for courts considering upgrades or new implementations, providing a reference to support initial research.

Table A: Commonly used equipment brands

Component	Common Brands
Audio/Video control system	Crestron, Extron, BiAmp, Q-SYS, Wirestorm, JAVS, BeInCourt
Audio DSP	Symetrix, BiAmp, Crestron, Extron, Q-SYS, JAVS
Amplifier	Powersoft, BiAmp, Extron, Crestron, QSC, JAVS
Microphones	Shure, Sennheiser, BeInCourt, FTR, JAVS
Cameras	PTZ Optics, Q-SYS, BiAmp, Aver, Wirestorm, JAVS, Marshall, Canon, Vaddio
Video processor	Extron, Crestron, BiAmp, RGB Spectrum, WolfVision, Lifesize
Document presentation system	Elmo, WolfVision
Audio/Video recording software	For The Record (FTR), Liberty, JAVS, TechUnicorn

2.7. General Video Recommendations

To simplify installation and reduce clutter, power over ethernet (PoE) encoder/decoder devices are recommended, as they eliminate the need for separate power sources and streamline connectivity. All audio and video equipment should be fully compatible with court recording systems and software platforms.

To support long-term scalability and flexibility, design courtroom audiovisual infrastructure with surplus capacity by including additional lines for monitors, microphones, and speakers beyond current needs. This proactive approach accommodates future technology upgrades while minimizing costly retrofits.

Future-proofing should also include cable pathways and power outlets. When installing new in-floor boxes, select sizes that allow for future expansion and ensure sufficient electrical capacity for both current and anticipated technologies.

Environmental considerations are also critical: equipment placement should account for acoustics, lighting, and temperature control. For example, position microphones and speakers to minimize echo and maximize clarity.

Finally, establish maintenance and support protocols for regular testing, calibration, and troubleshooting. If possible, dedicated technical support resources should be available to assist staff and participants.

3. Displays

This section outlines optimal display specifications to support in-person, remote, and hybrid hearings, particularly those involving electronic evidence. The primary goal is to ensure that every participant, including those with ADA accessibility needs, has a clear and unobstructed view of all relevant content.

To meet the demands of modern courtrooms, displays should facilitate:

- **Evidence viewing.** Ensure both in-person and remote participants can clearly view exhibits.
- **Electronic recording and monitoring.** Provide support for real-time rough transcript display (speech-to-text) and recording oversight.
- **ADA accessibility.** Ensure visibility and usability for participants with disabilities.

In addition to these functional requirements, placement recommendations are provided in the [Courtroom Layouts](#) section for optimal positioning and sightlines.

3.1. Performance-Based Approach

Each of California's more than 2,000 courtrooms has unique characteristics, including different layouts, ceiling heights, lighting conditions, and seating arrangements. Because of this variability, a one-size-fits-all approach to display specifications is neither practical nor effective. Instead, a performance-based methodology that adapts to each courtroom's specific needs is strongly recommended. Performance-based design is:

- **Scalable.** It accommodates any courtroom layout, regardless of size or configuration.
- **Standards-driven.** It aligns with recognized industry benchmarks for image size and contrast ratios.
- **Flexible.** It supports a wide range of technologies, including flat panels, video walls, and repeater monitors.
- **Future-proof.** It adapts to evolving hardware and emerging display technologies.

Courts benefit from adopting this performance-based approach with:

- Repeatable method to calculate the right display sizes, quantities, and placements;
- Clear pass/fail criteria based on industry standards; and
- Flexibility to accommodate ADA needs and interpreter visibility.

3.2. Industry Standards

Using audiovisual industry standards that scale based on the courtroom layout and viewing requirements is strongly recommended. The Audiovisual and Integrated Experience Association (AVIXA), a global audiovisual trade organization, has developed display standards based on functional needs. The following two AVIXA standards are recommended for use for courtroom monitor selection:

- **Display Image Size for 2D Content in Audiovisual Systems (DISCAS):**⁴ Calculates image size based on viewer distance and task.
- **Image System Contrast Ratio(ISCR):**⁵ Ensures the minimum acceptable contrast ratios for legibility.

3.2.1. DISCAS

The DISCAS standard provides the calculation for the appropriate image height based on the viewer's distance and the task to be performed. There are three categories of tasks.

- **Passive Viewing (PV):** For general video viewing (e.g., spectators), the farthest viewer should be no more than 8× the image height away.
- **Basic Decision Making (BDM):** For identifying speakers or viewing remote participants, the limit is 6× the image height.
- **Analytical Decision Making (ADM):** For reading detailed content (e.g., exhibits or transcripts) the viewer should be within 4× the image height.

The quick reference chart below calculates common farthest viewer distances and viewing modes using a 16:9 aspect ratio. The chart includes image height and diagonal size in inches.

Table B. DISCAS quick reference chart

Farthest viewer (ft)	Viewing mode	Image height (in)	Diagonal size (in)
30	PV	45.0	91.8
30	BDM	60.0	122.4
30	ADM	90.0	183.6
40	PV	60.0	122.4
40	BDM	80.0	163.2
40	ADM	120.0	244.8
50	PV	75.0	153.0
50	BDM	100.0	204.0
50	ADM	150.0	306.0
60	PV	90.0	183.6
60	BDM	120.0	244.8
60	ADM	180.0	367.2

⁴ Display Image Size for 2D Content in Audiovisual Systems, www.avixa.org/standards/display-image-size-for-2d-content-in-audiovisual-system.

⁵ Image System Contrast Ratio, www.avixa.org/standards/image-system-contrast-ratio

3.2.2. AVIXA ISCR

This standard ensures displays are legible under courtroom lighting conditions and, like DISCAS, is based on the category of task to be performed.

- **PV:** minimum contrast ratio of 7:1
- **BDM:** minimum contrast ratio of 15:1
- **ADM:** minimum contrast ratio of 30:1

These thresholds ensure that displays are both large enough and readable in real-world conditions.

3.3. Application in a Typical Trial Courtroom

This example illustrates how AVIXA standards apply in a standard courtroom setup, assuming 16:9 aspect ratio for all displays.

3.3.1. Desktop displays

- Viewing distance: 3 ft
- Task type: ADM
- Image height $\geq 3 \div 4 = 0.75$ ft (9 in)
- Diagonal $\approx 2.04 \times 9 = 18.4''$
- Recommendation: minimum 22–24" desktop displays

3.3.2. Front display for jurors

- Farthest juror distance: 35 ft
- Task type: BDM
- Image height $\geq 35 \div 6 = 5.83$ ft (70 in)
- Diagonal $\approx 2.04 \times 70 = 143''$
- Recommendation: dual 98" displays or side repeaters

3.3.3. Public gallery

- Farthest viewer distance: 60 ft
- Task type: PV
- Image height $\geq 60 \div 8 = 7.5$ ft (90 in)
- Diagonal $\approx 2.04 \times 90 = 183''$
- Practical solution: multiple large-format displays or a video wall

3.3.4. ISCR verification

Example measurement:

- $L_{\text{white}} = 180 \text{ cd/m}^2$
- $L_{\text{black}} = 6 \text{ cd/m}^2$
- Contrast ratio = 30:1

Result: passes ADM threshold.

3.4. Minimum Required Displays

The calculations in the previous section yield the following recommendations for courtroom monitors.

Table C. Minimum Required Displays

Role	Quantity	Display size/notes
Judge	1	22–24" (if unable to see other display)
Clerk	1	22–24" (if unable to see other display)
Court reporter	1	22–24" (if unable to see other display)
Witness	1	22–24" (if unable to see other display, touch-enabled recommended)
Counsel	≥ 2	22–24" (if unable to see other display)
Jurors	12	~22" (if unable to see other display)
Spectators and jurors	2	Large displays (BDM-sized recommended)
ADA accommodation	1	24–27" mobile monitor (recommended)

Minimum Technology Standards for Remote Proceedings (SB 133) states that courtroom technology must be capable of allowing the judicial officer and all participants attending the proceeding in person to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute. Specific placement and quantity of displays is not mandated.

3.5 General Display Recommendations

Other actions to consider for courtroom displays include:

- Support remote display integration, including screen sharing for exhibits.
- Integrate technology into courtroom furniture and architectural elements, embedding displays into judge benches, counsel tables, and witness stands, and ensuring that sightlines and decorum are preserved.
- Provide touchscreen monitors for witnesses.
- Use mobile monitors for individuals with accessibility needs to ensure full functionality and accessibility.

4. Infrastructure

A well-designed infrastructure is the backbone of reliable courtroom technology. It must provide robust electrical capacity, scalable network connectivity, and efficient cable management to support current systems and future upgrades. Proper planning ensures uninterrupted operation, protects sensitive equipment, and maintains courtroom aesthetics while accommodating evolving technology requirements. As courtrooms increasingly adopt hybrid proceedings and advanced audiovisual systems, infrastructure must anticipate higher power loads, greater bandwidth demands, and integration with modern protocols. Incorporating flexibility, redundancy, and future-proof design from the outset reduces downtime, minimizes disruptions during upgrades, and helps avoid costly retrofits as standards and technologies evolve.

4.1. Electrical Recommendations

Courtroom technology requires reliable and adaptable electrical infrastructure. The following specifications help ensure sufficient capacity for current systems while accommodating future upgrades without disruption.

4.1.1. *Infrastructure capacity and scalability*

The electrical infrastructure must be robust and scalable, with capacity to support existing equipment and anticipated future technologies. Planning should account for increased power loads and incorporate flexible distribution options to meet evolving requirements.

4.1.1.1. Power protection for audiovisual equipment. To prevent equipment damage and ensure uninterrupted operation during unexpected power loss and electrical surges, each hardware rack should include:

- Rack-mounted uninterruptible power supply (UPS); and
- Surge protection.

4.1.1.2. In-floor box specifications. Appropriately sized in-floor boxes are strongly recommended. Key requirements include:

- Strategic positioning to meet current cabling needs and allow for future expansion; and
- Support for multiple connectors and power sources to enable seamless integration of new equipment as technology evolves.

4.1.1.3. Electrical outlet placement: Adding new audiovisual equipment may necessitate the provision of additional power. While some devices can be powered via power over ethernet switches, others will require dedicated circuits and outlets. Electrical outlets should be strategically located to support all necessary components such as:

- Outlets for equipment racks within the courtroom;
- Two outlets at each attorney table for laptops and video encoders/personal displays;

- One outlet for each wall-mounted display or projector;
- A display positioned opposite the jury box and its own electrical circuit;
- A display behind the judge for audience viewing and a dedicated circuit; and
- Individual personal displays at the judge's bench and witness stand for convenient viewing and potential annotation and dedicated circuits.

4.2. Network Recommendations

Current courtroom technology designs significantly increase the number of devices requiring data connections. Although some existing unused data connections may be repurposed, it is unlikely that the available connections will be sufficient to meet the expanded needs. To accommodate this need:

- Equip each courtroom with a full 48-port network switch to support all connected devices.
- Isolate audio and video network traffic from the broader court network to prevent performance degradation.
- Install the network switch in a data closet when one is available and cable pathways exist.
- Install the switch in the courtroom when a data closet is unavailable or cable pathways are cost-prohibitive, using fan-less switches to minimize noise and creating a port-channel uplink using two connections from the nearest data closet.

4.2.1. Cooling requirements

If network switches and other audio/video equipment are installed in the nearest data closet, it is essential to ensure adequate cooling within intermediate distribution frame (IDF) closets to maintain optimal equipment performance.

4.2.2. Cable management and routing

Effective cable management is essential for safety, visual appeal, and long-term system performance. Installations should include organized routing paths, clearly labeled connections, and protective enclosures to prevent accidental damage and simplify maintenance. Consider adopting modular cabling systems that allow for easy upgrades and reconfiguration as technology needs evolve.

Minimize visible wires in the courtroom by strategically placing network connections and electrical outlets to eliminate the need for extension cords. Position outlets to support additional equipment for court reporters and interpreters and other devices at podiums and throughout the courtroom, ensuring flexibility for various proceedings.

When adding additional cabling in the courtroom, subfloor conduit installations are strongly preferred to maintain courtroom decorum and aesthetics. This method conceals power and data cabling, protecting them from physical damage and reducing tripping hazards.

If subfloor conduit installation is not feasible due to financial or structural constraints, over-the-carpet cable management trays may be used as an alternative. These trays should feature multiple

channels to physically separate electrical power cables from data cables, minimizing signal interference and improving system reliability.

4.3. Workstation Recommendations

Appropriate infrastructure should be provided for both staff and non-staff participants.

- Attorney tables should be equipped with HDMI and USB-C ports to facilitate evidence presentation during proceedings.
- The court reporter station must have access to a raw audio feed; access to video feed is recommended to support remote reporting capabilities effectively.
- Office areas should be equipped with internet and electrical outlets to accommodate official court reporters, employee interpreters, or other court personnel working from court-provided office spaces outside of the courtroom.

4.4. Accessibility and ADA Compliance

All equipment installations must consider accessibility requirements, including accommodations for individuals with disabilities. ADA compliance considerations include:

- Installation of amplified audio systems;
- Provision of assistive listening systems;
- Ensuring wall-mounted equipment does not protrude more than 4 inches; and
- Provision of appropriate signage.

4.5. Best Practices

Ensuring reliable courtroom technology requires a structured approach focused on preventing disruptions and maintaining operational integrity. Best practices prioritize proactive strategies over reactive fixes to reduce downtime and enhance system performance.

4.5.1. Routine updates.

Implement regular software and hardware updates to minimize security vulnerabilities, maintain compatibility, and optimize functionality.

4.5.2. System monitoring and diagnostics.

Deploy continuous monitoring tools to track system health, detect anomalies, and generate alerts for potential issues before they escalate.

4.5.3. Redundancy and backup systems.

Incorporate redundant components for critical systems such as audio, video, and networking. Maintain backup configurations and spare hardware to ensure rapid recovery in case of failure.

4.5.4. Power management.

Use uninterruptible power supplies and surge protection for all audiovisual racks and essential equipment to prevent damage and maintain operation during power fluctuations.

4.5.5. Access control and security.

Enforce user authentication and role-based access to prevent unauthorized changes to system settings or configurations.

4.5.6. Documentation and configuration management.

Maintain detailed documentation of system architecture, wiring diagrams, and configuration settings. Apply version control to all updates and changes.

4.5.7. Staff training and support.

Provide ongoing training for courtroom personnel on equipment operation, troubleshooting, and emergency procedures. Ensure quick access to technical support during proceedings.

4.5.8. Scheduled preventive maintenance.

Establish a maintenance calendar for cabling inspections and **connectors** and hardware integrity. Replace aging components proactively to avoid unexpected failures.

4.5.9. Disaster recovery planning.

Develop and periodically test a recovery plan for major disruptions, including backup media, alternative connectivity options, and failover procedures.

5. Courtroom Layouts

This section presents a series of detailed drawings that illustrate typical courtroom floorplans⁶ designed to support audiovisual planning and integration. For each floor plan, one diagram highlights the strategic placement of cameras, microphones, and speakers to ensure optimal coverage for recording, amplification, and remote participation. A second diagram focuses on display positioning, showing recommended locations for monitors, video walls, and repeater screens to provide clear sightlines for judges, jurors, counsel, witnesses, and public observers. Together, these visual guides serve as practical references for architects, audiovisual designers, and technology teams, helping them achieve balanced acoustics, unobstructed views, and seamless technology integration within the courtroom environment.

Specific requirements and recommendations can be found elsewhere in this guide, in the following sections:

- [Audio and Video](#): Guidance on cameras, microphones, and speakers, including placement strategies and technical specifications.
- [Displays](#): Recommendations for selecting and positioning monitors, projectors, and screens.
- [Infrastructure](#): Foundational elements such as network connectivity, electrical power, and physical readiness of the courtroom.

As noted elsewhere in this document, for an optimal remote experience, participants should be able to both see and hear each other and the proceedings. However, all phases of the Advancing the Hybrid Courtroom Workstream acknowledge that some remote participants may lack the bandwidth or capability for video. While this guide assumes participants can see and be seen, the inability to appear via video and participate using audio only is not considered detrimental to remote participation, unless the court orders the proceeding to be conducted using video, or as required or allowed by statute.

⁶ Source: *California Trial Court Facilities Standards: 2023 Edition*, courts.ca.gov/system/files/file/2023_ctcfs_24_09_19.pdf.

5.1. Layout 1: Center Bench

5.1.1. Audio and video placement

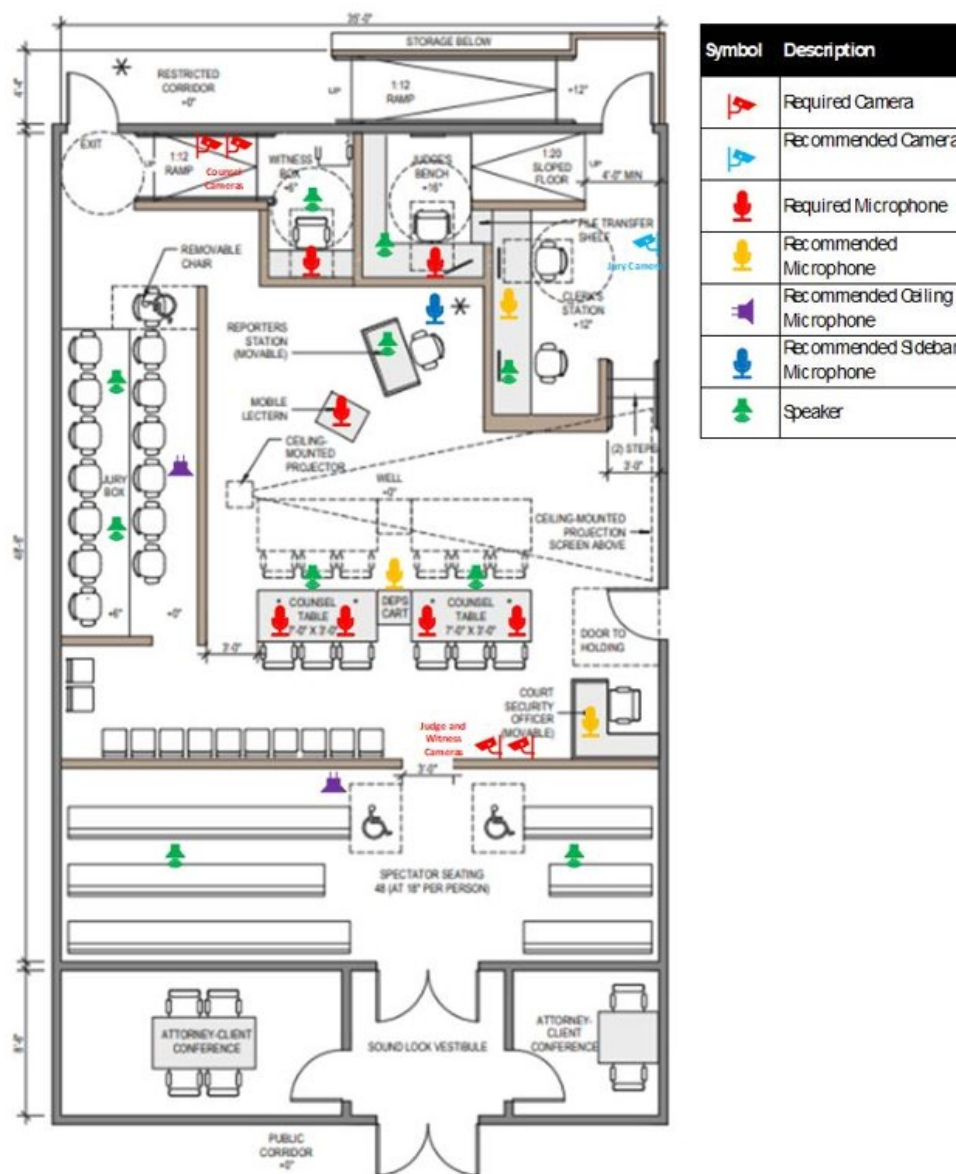


Figure T2.1 Typical Trial Courtroom—Center Bench A

5.1.2. Display placement

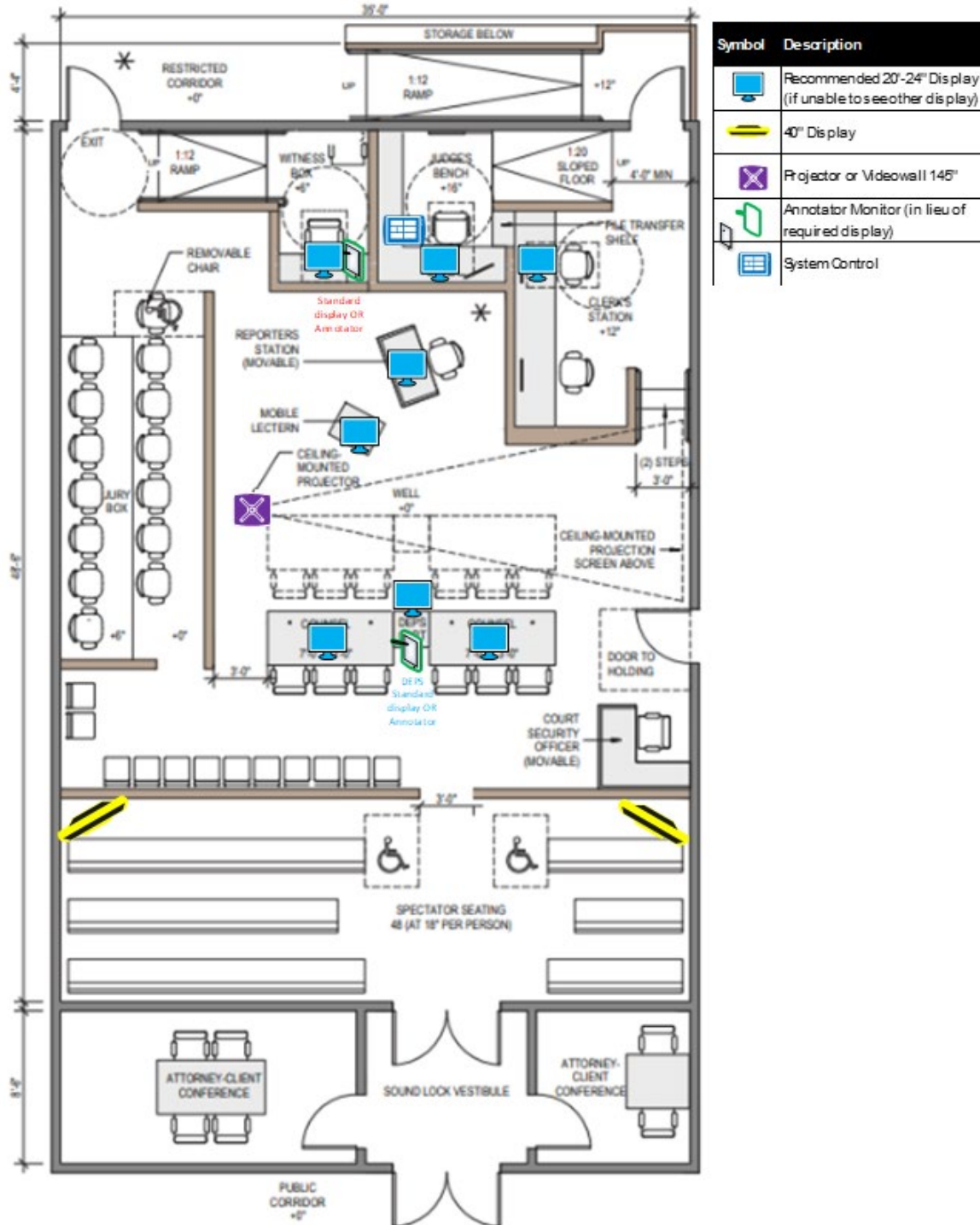


Figure T2.1 Typical Trial Courtroom—Center Bench A

5.2. Layout 2: Corner Bench

5.2.1. Audio and video placement

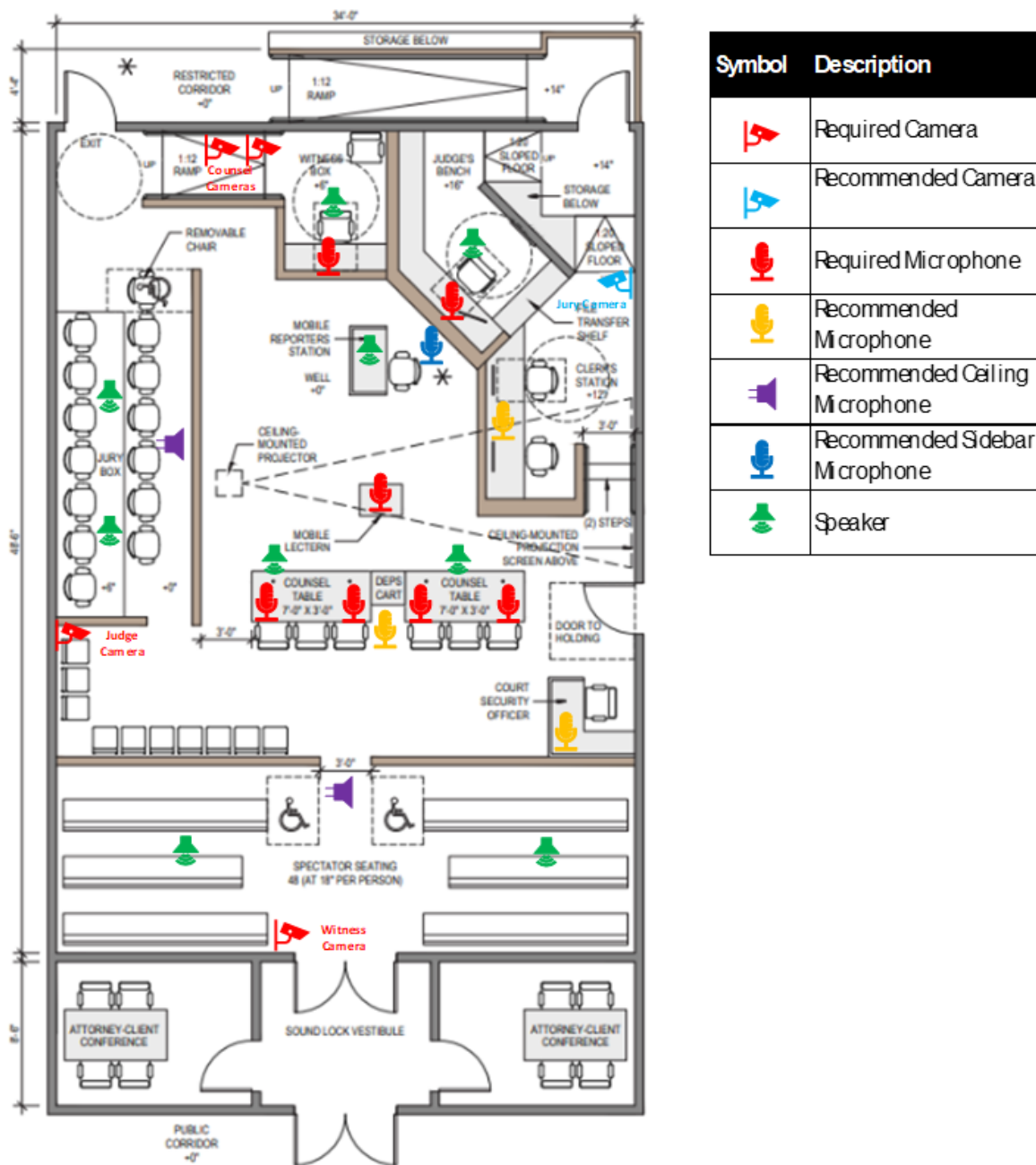


Figure T2.6 Typical Trial Courtroom—Corner Bench A

5.2.2. Display placement

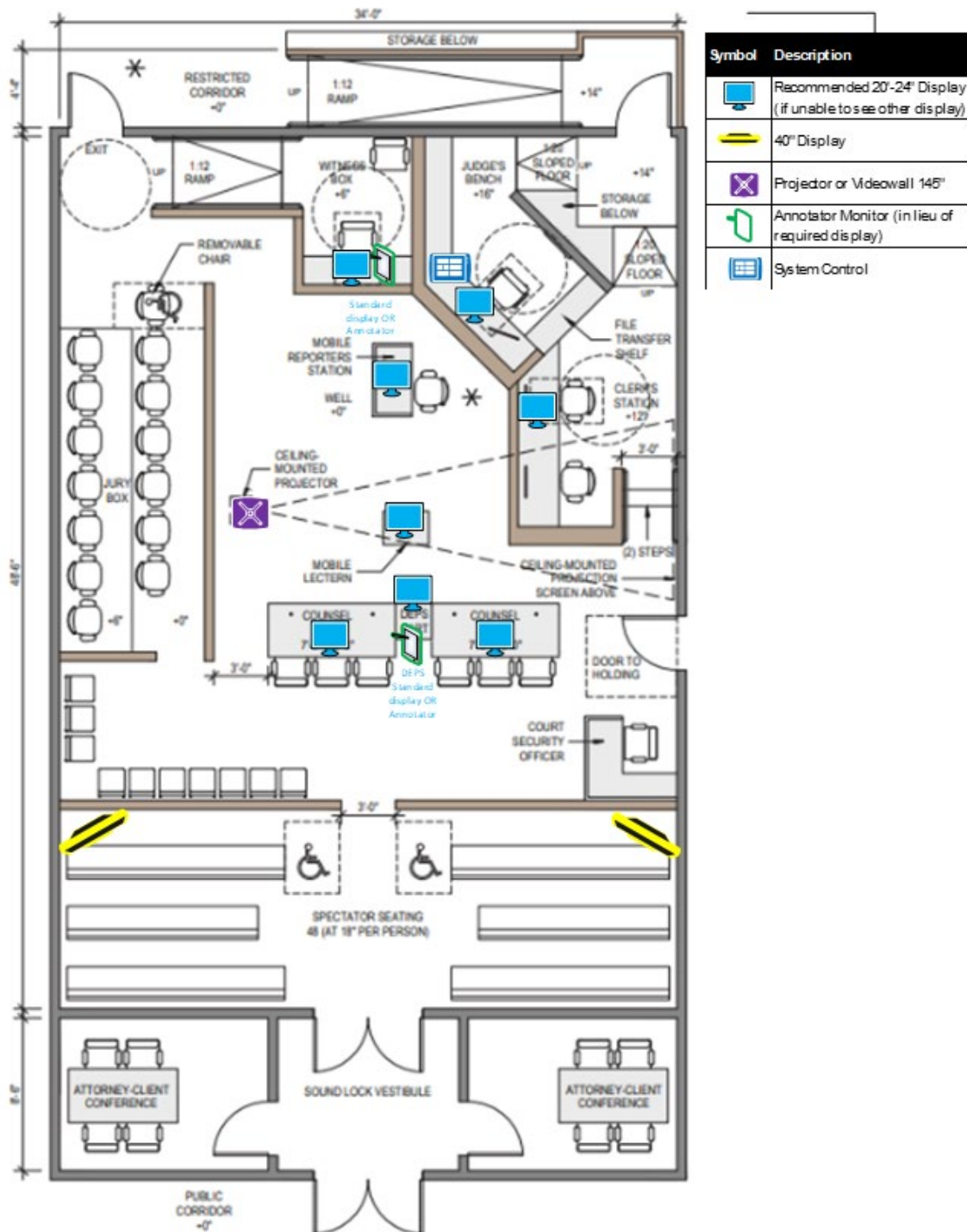


Figure T2.6 Typical Trial Courtroom—Corner Bench A

5.3. Layout 3: Large Trial—Center Bench

5.3.1. Audio and video placement

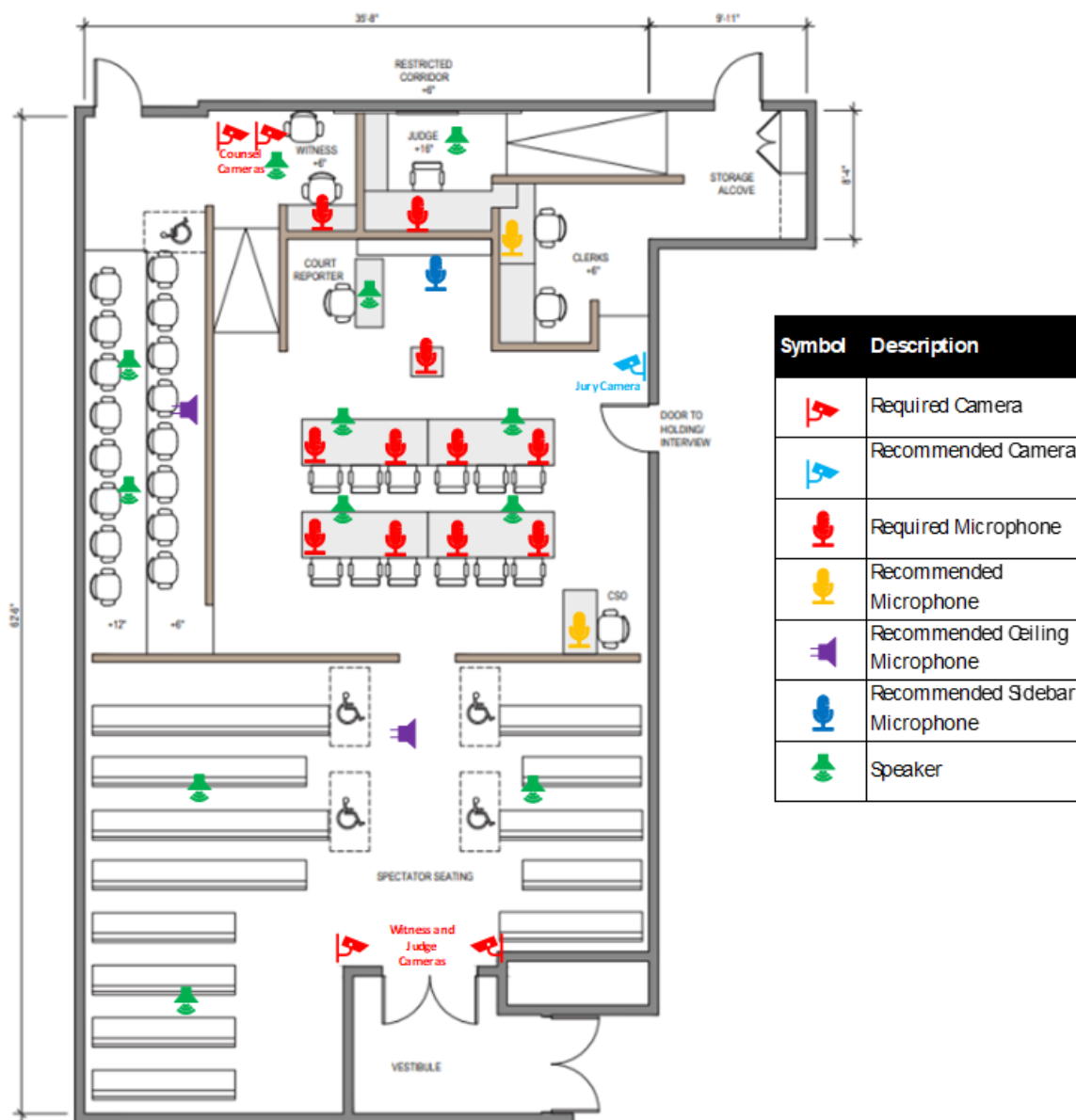


Figure T2.15 San Diego Central Courthouse, Large Trial Courtroom—Center Bench

5.3.2. Display placement

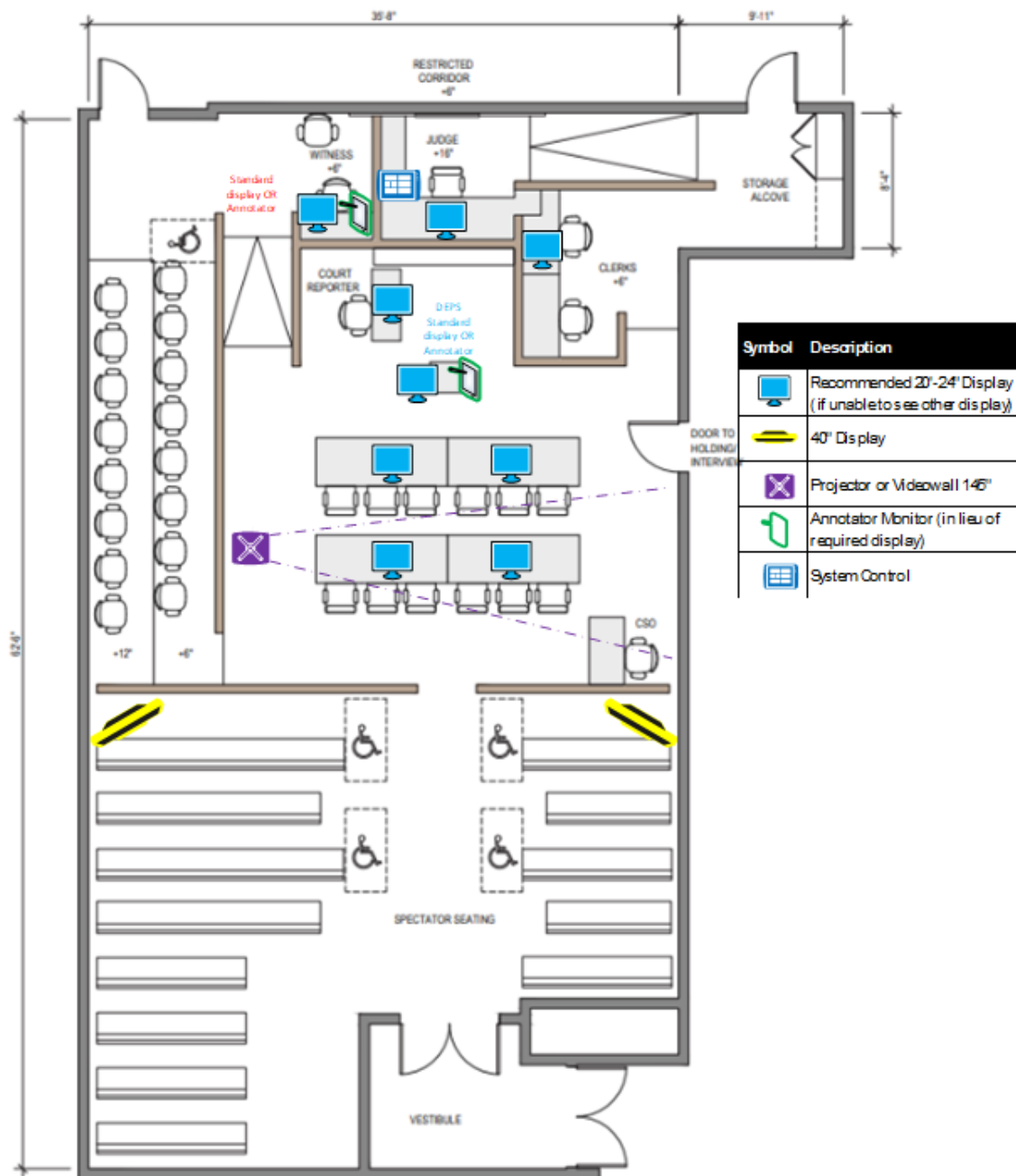


Figure T2.15 San Diego Central Courthouse, Large Trial Courtroom—Center Bench

5.4. Layout 4: Double Jury—Center Bench

5.4.1. Audio and video placement

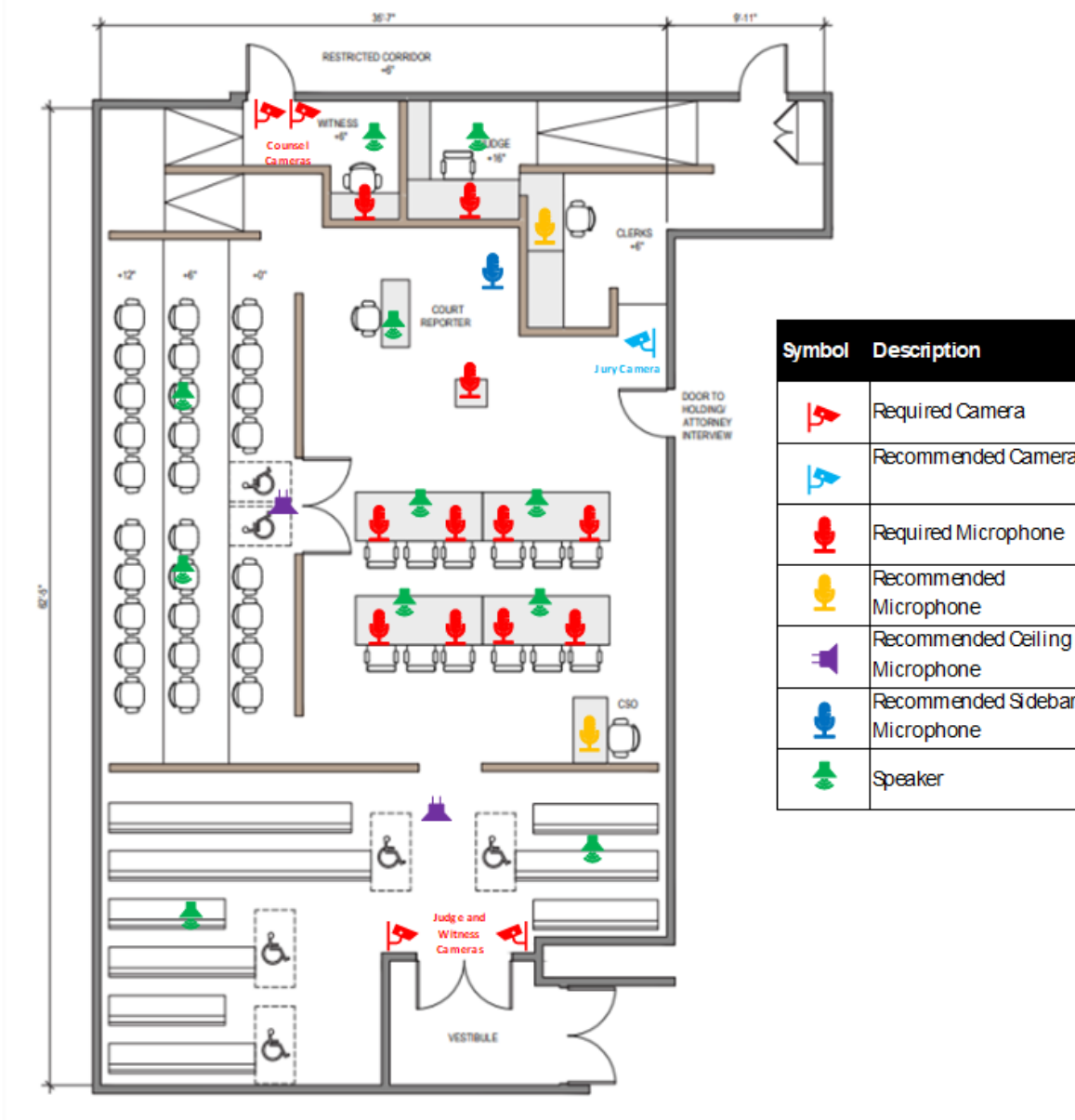


Figure T2.16 San Diego Central Courthouse, Double Jury Courtroom—Center Bench

5.4.2. Display placement

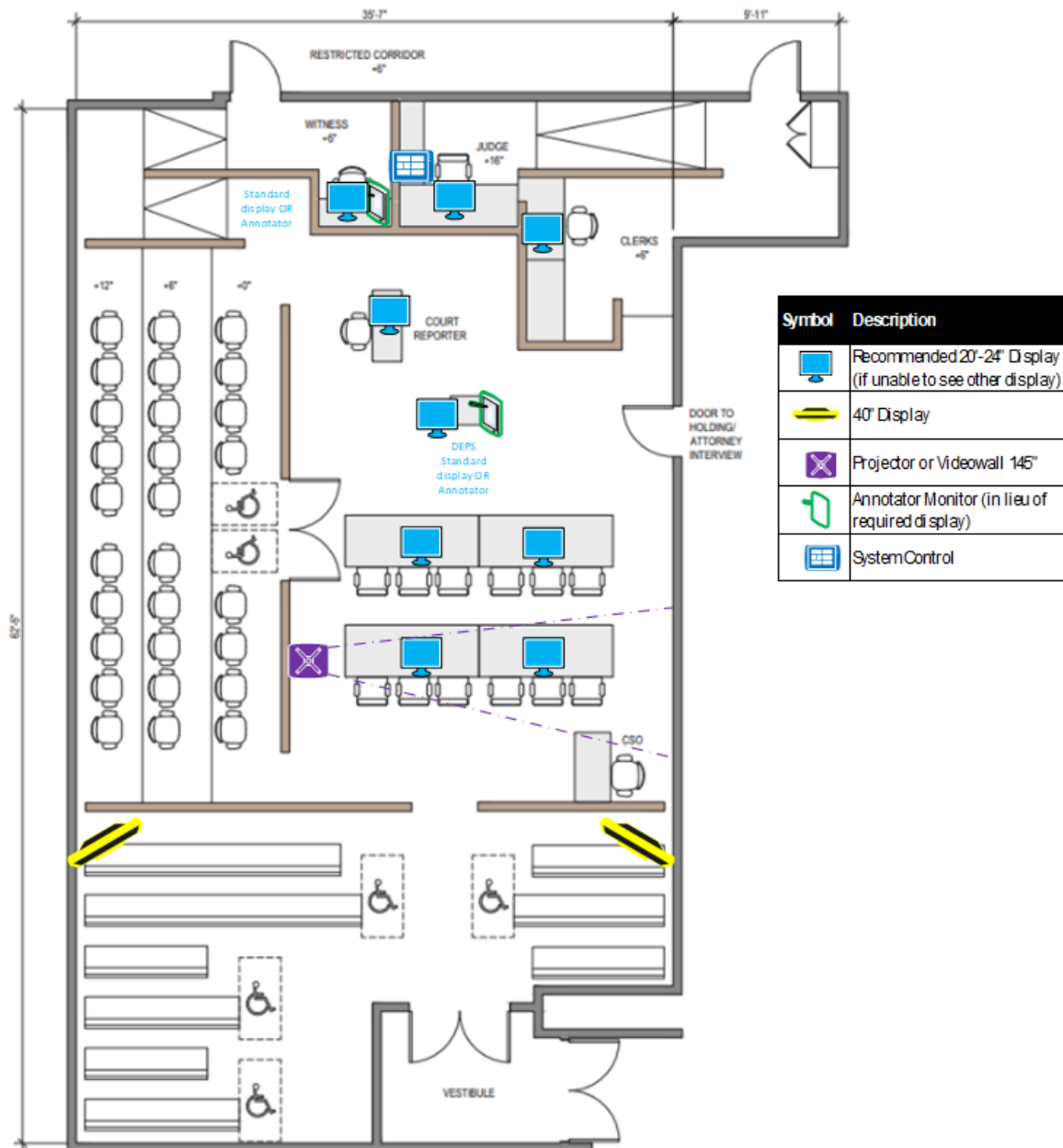


Figure T2.16 San Diego Central Courthouse, Double Jury Courtroom—Center Bench

5.5. Layout 5: Double Jury—Corner Bench

5.5.1. Audio and video placement

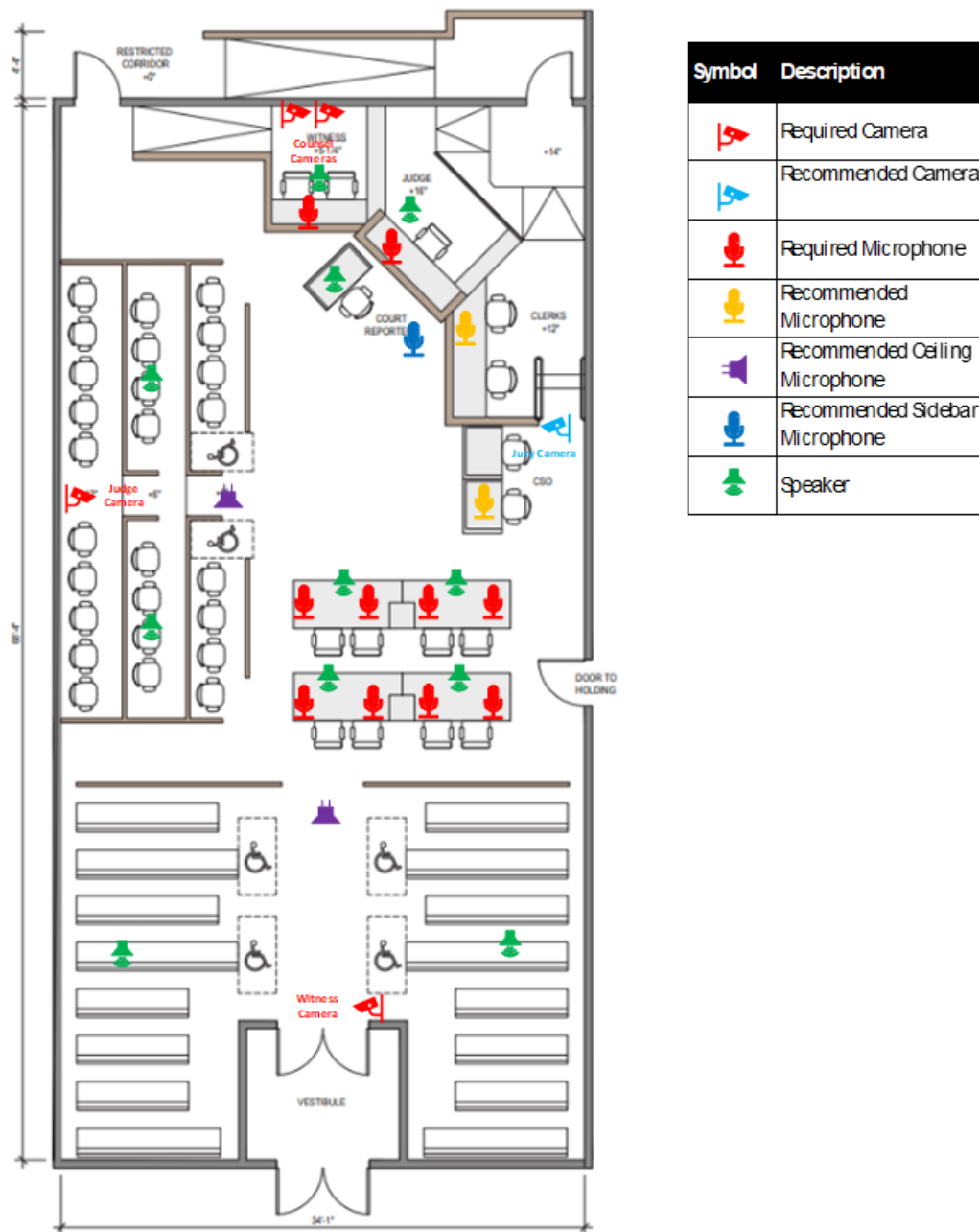


Figure T2.17 San Bernardino Justice Center, Double Jury Courtroom—Corner Bench

5.5.2. Display placement

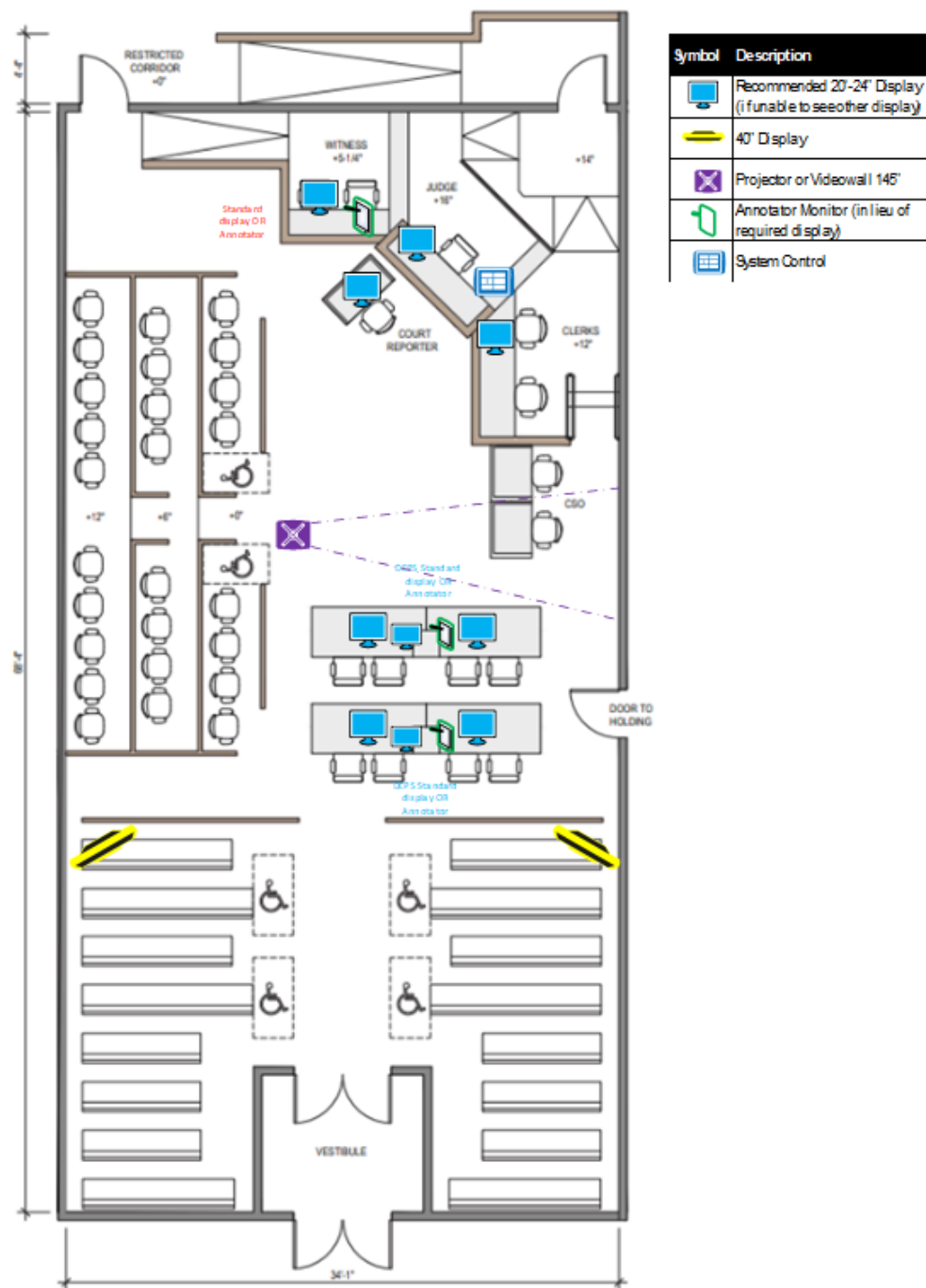


Figure T2.17 San Bernardino Justice Center, Double Jury Courtroom—Corner Bench

5.6. Layout 6: Arraignment

5.6.1. Audio and video placement

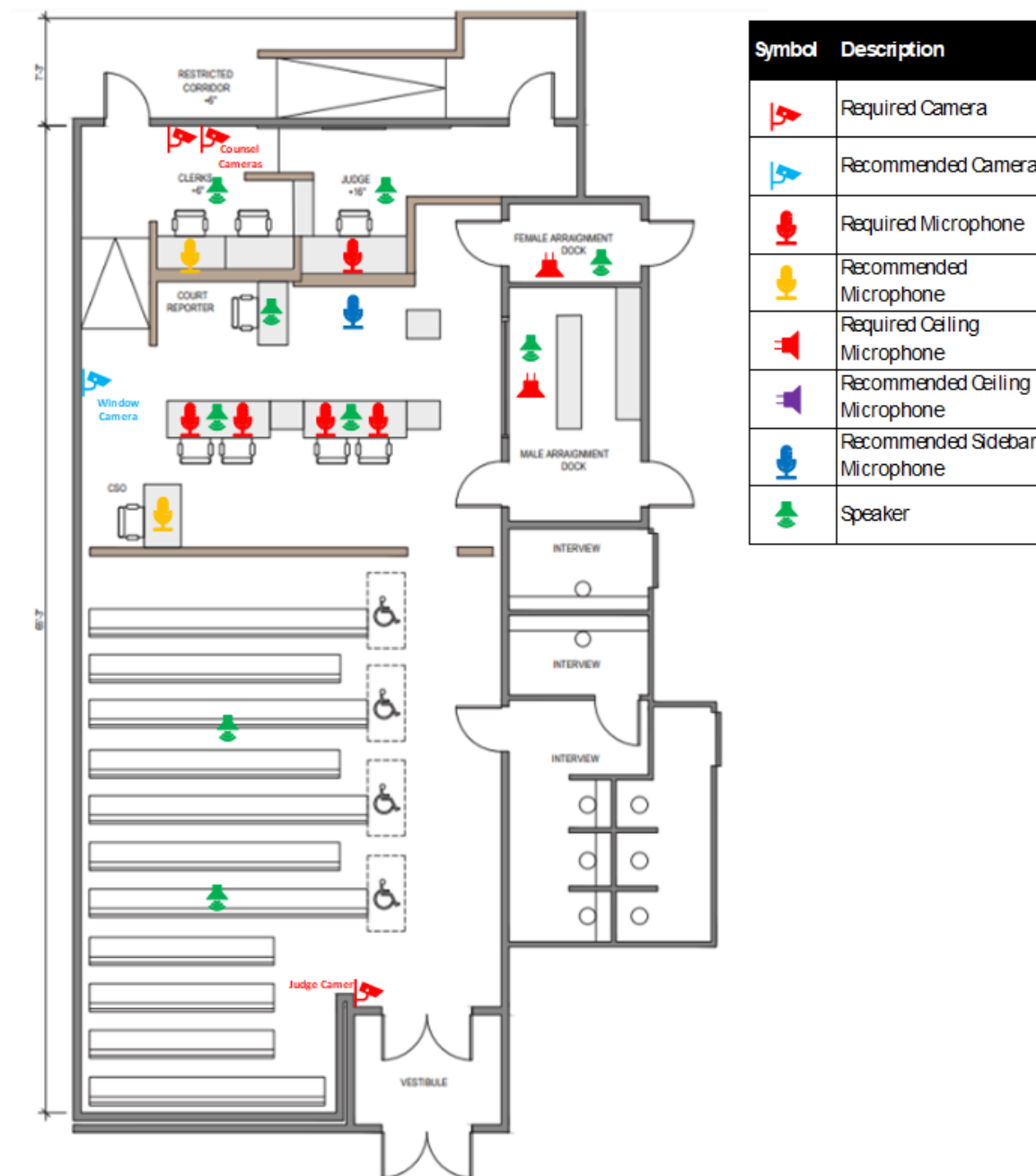


Figure T2.18 San Diego Central Courthouse, Arraignment Courtroom—Center Bench

5.6.2. Display placement

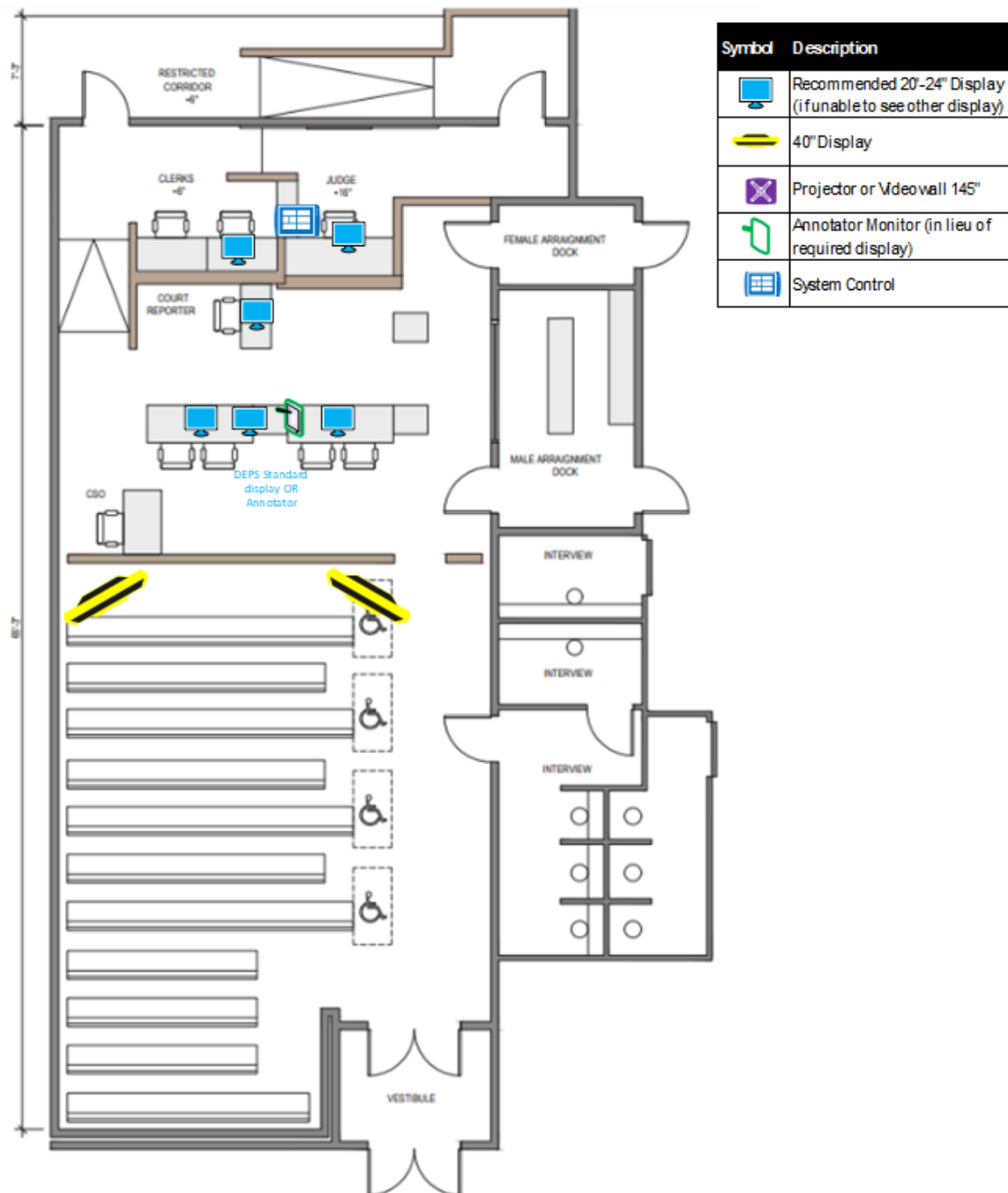


Figure T2.18 San Diego Central Courthouse, Arraignment Courtroom—Center Bench

5.7. Layout 7: Family Courtroom

5.7.1. Audio and video placement

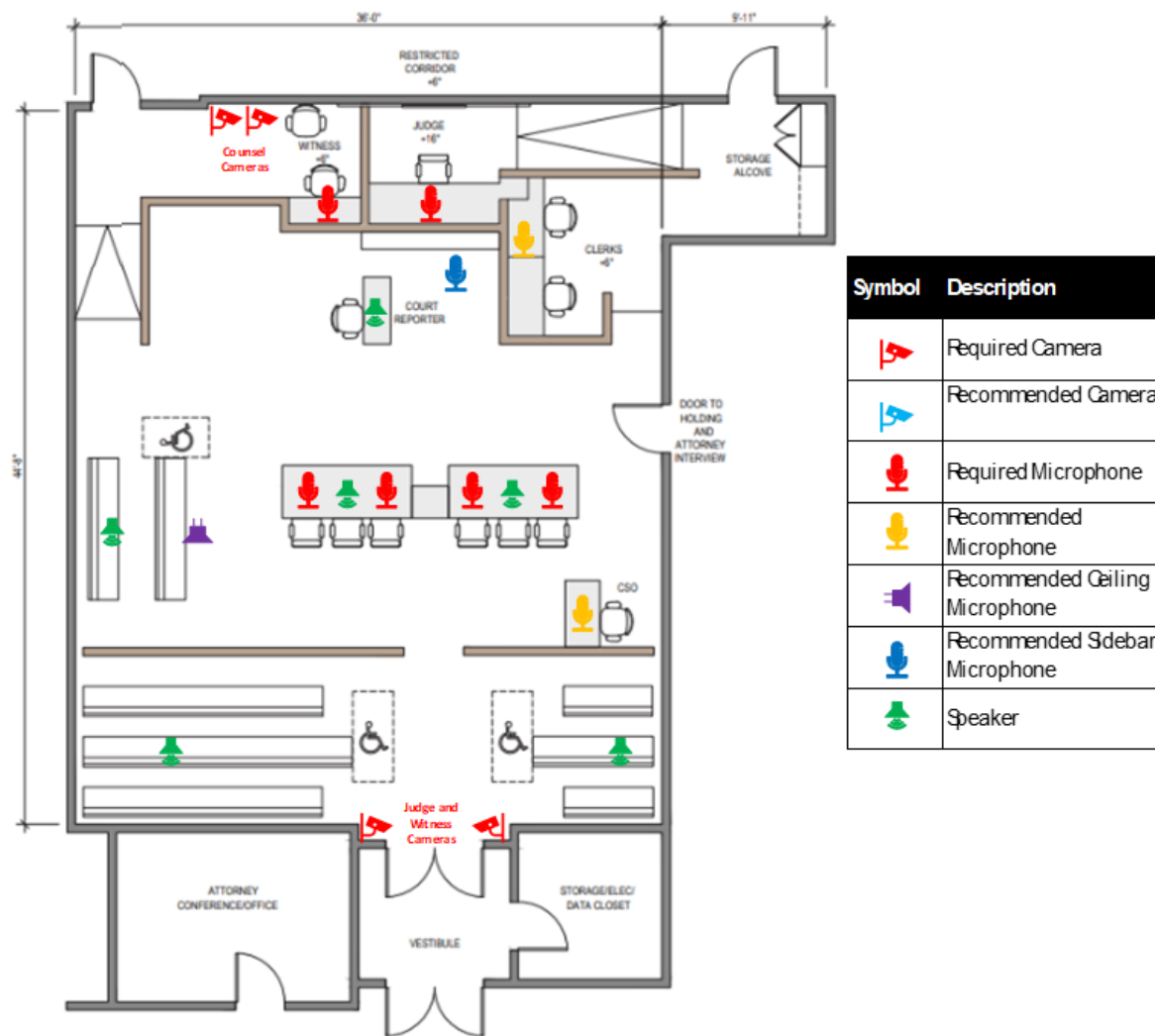


Figure T2.19 San Diego Central Courthouse, Family Courtroom—Center Bench

5.7.2. Display placement

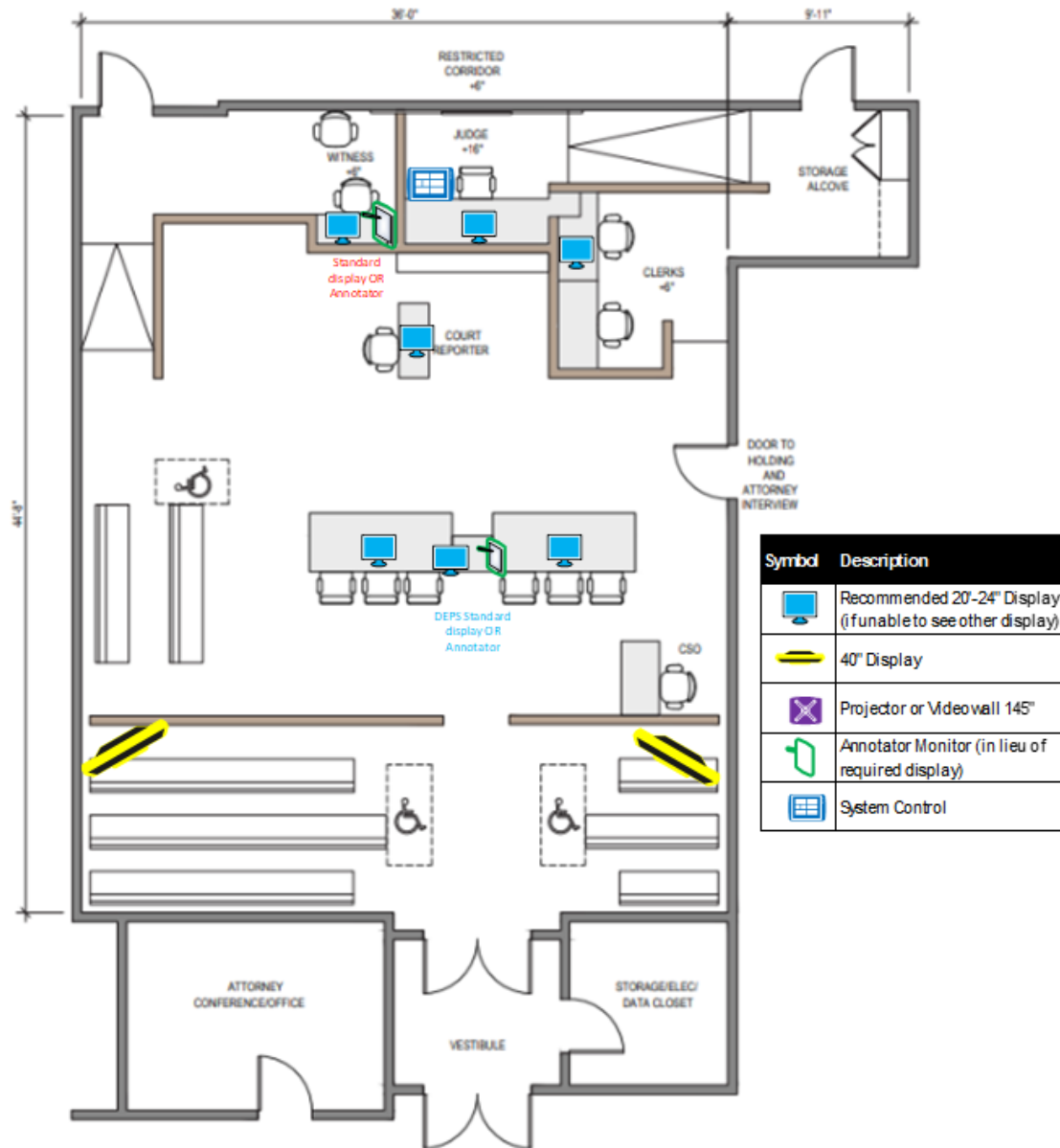


Figure T2.19 San Diego Central Courthouse, Family Courtroom—Center Bench

Appendix A: Recommendation Summary Tables

Table 1. Summary of general courtroom operations recommendations

Category	Recommendation
Ergonomic workspaces	Provide ergonomic setups for staff and judicial officers
Unobstructed judicial view	Avoid equipment placement that blocks line of sight
Juror display visibility	Position monitors for clear juror view
Interpreter audio	Configure audio for English rendition only in courtroom audio feeds.
Electronic recording status	Display clear recording status indicators
Remote staff connectivity	Establish clear protocols for remote staff services
Training and support	Provide comprehensive training for staff and stakeholders
Internet access	Adopt high speed wireless standards
Shared microphones	Develop a procedure to follow when dedicated microphones are unavailable
Handling technical issues	Develop protocol for addressing connectivity failures
Remote participants and observers	To streamline conference management, limit remote proceedings to essential participants; allow observers when needed and appropriate.
Identity verification	Require participant identification before proceedings begin
Notice of electronic monitoring	Comply with Government Code section 69957 for electronic monitoring

Table 2. Summary of conferencing platform recommendations

Feature/Protocol	Recommendation
Speaker prioritization	Enable platform features that highlight the active speaker for clarity.
Camera configuration and pinning	Configure views or allow pinning of key participants (judges, witnesses, attorneys).
Chat visibility settings	Define whether chat is visible to host/co-host and judicial officers.
Participant identification	Implement protocols to verify identity, require display of full names, update participant labels, and track late registrants.
Judicial control over participation	Provide tools for muting, removing participants, and disabling video feeds.
Entry and reentry controls	Use virtual lobbies for controlled entry and reentry and allow blocking when needed.
Confidential breakout sessions	Enable private breakout rooms for sidebars or sensitive discussions.
Remote evidence presentation	Establish protocols for sharing and annotating digital evidence during hearings.

Table 3. Summary of remote proceedings documentation recommendations

Category	Recommendation
Technology in the physical courtroom	• Specify availability of microphones and displays at counsel tables. • Outline evidence presentation equipment and instructions for use. • Indicate availability of internet or Wi-Fi in the courtroom. • Provide court contact information for technical support. • Publish diagrams or photos showing equipment placement. • Provide specifications for supported file formats for evidence presentation. • Include instructions for connecting personal devices to courtroom systems. • Indicate availability assistive listening equipment and signage.
Remote appearance technology requirements	• Identify supported conferencing platform(s) and download instructions. • Explain registration procedures for remote appearances. • Provide instructions for equipment testing prior to the hearing. • List court contact information for technical support. • Publish minimum bandwidth and device specifications for remote participants. • Provide guidance on using virtual backgrounds or camera positioning to maintain decorum. • Offer troubleshooting steps for common connectivity issues.
Describe what participants can expect	• Identify staff who may participate remotely (e.g., interpreters, court reporters). • State whether proceedings are electronically recorded. • Include notice that under California Rules of Court, rule 1.150, unauthorized recording is prohibited. • Describe equipment available for digital evidence presentation and protocols for remote access to exhibits. • Specify equipment available or needed for remote interpretation. • Explain protocols for muting/unmuting and speaking order during remote sessions. • Provide instructions for submitting exhibits electronically before the hearing. • Outline contingency plans for technical failures. • Include etiquette guidelines for remote participants (e.g., dress code, background noise control).

Table 4. Summary of core technology recommendations

Component	Recommendation
Audiovisual control system	• Select a control system that supports customizable presets for common courtroom scenarios (e.g., arraignment, jury trial, remote hearing). • Ensure the interface is user-friendly for judicial officers and clerks, with clear labeling for microphone activation, video switching, and evidence display. • Integrate security features such as role-based access to prevent unauthorized changes. • Provide training sessions for staff on using the control panel effectively.
Audio DSP	• Configure DSP settings for automatic gain control to maintain consistent audio levels. • Enable noise suppression and echo cancellation for hybrid hearings to improve clarity. • Include remote monitoring capability so technical staff can adjust DSP settings during proceedings if needed.
Amplifier	• Choose amplifiers sized appropriately for the courtroom's acoustics and speaker layout. • Schedule regular maintenance and load testing to confirm consistent performance.
Audio balancing (mix-minus)	• Implement dedicated audio routing for remote participants to avoid echo and feedback. • Test mix-minus configurations during system setup and periodically thereafter. • Document the audio routing plan for quick troubleshooting.

Table 5. Summary of microphone location recommendations

Location/Type	Recommendation
Judge's bench	1 microphone
Witness stand	1 microphone
Lectern/podium	1 microphone (wireless optional)
Counsel tables	Minimum 2 microphones per table
Court reporter station	1 microphone
Court interpreter area	1 microphone
Sidebar area	1 microphone
Jury box	1 microphone (overhead or wall mount)
Clerk station	1 microphone
Bailiff station	Wireless option
Audience area	Optional microphone
Evidence presentation	Optional microphone
Wireless microphones	For flexibility
Lapel microphones	For mobility

Table 6: Summary of speaker location recommendations

Location
Jury box
Counsel tables
Court reporter station
Clerk station
Judge's bench
Witness stand
Audience area

Table 7: Summary of speaker recommendations

Category	Recommendation
Protocol considerations	• Specify Dante-enabled devices in procurement documents. • Configure VLANs for Dante and video traffic to ensure network stability. • Train IT staff on Dante Controller software for device management. • Document daisy-chain topology for troubleshooting and scalability. • Avoid purchasing AVB-specific hardware for new installations. • Include Dante compliance in request for proposals for audio system vendors. • Plan for future expansion using standard Ethernet-based solutions.
Speaker hardware considerations	• Select ceiling-mounted speakers with wide dispersion for uniform coverage. • Ensure speakers support Dante protocol or traditional cabling for flexibility. • Verify mounting hardware compatibility with courtroom ceiling structure. • Document speaker placement in design plans to avoid visual obstructions. • Identify key locations (judge's bench, witness stand, counsel tables) for combo units. • Confirm microphone sensitivity and speaker wattage meet courtroom standards. • Test integration with existing DSP systems. • Include redundancy plans for critical audio points.
Room acoustics	• Conduct an acoustic analysis before installation. • Install absorptive panels on walls and ceilings where feasible. • Implement DSP-based echo cancellation for remote audio feeds. • Validate latency performance during hybrid session simulations. • Schedule quarterly sound audits with certified audio technicians. • Maintain logs of DSP settings and calibration changes. • Use test tones and speech intelligibility metrics during audits. • Update acoustic treatments as needed based on audit findings.

Table 8. Summary of display recommendations

Role	Quantity	Display size/notes
Judge	1	22–24" (if unable to see other display)
Clerk	1	22–24" (if unable to see other display)
Court reporter	1	22–24" (if unable to see other display)
Witness	1	22–24" (if unable to see other display, touch-enabled recommended)
Counsel	≥ 2	22–24" (if unable to see other display)
Jurors	12	~22" (if unable to see other display)
Spectators and jurors	2	Large displays (BDM-sized recommended)
ADA accommodation	1	24–27" mobile monitor (recommended)

Table 9. Summary of electrical recommendations

Location	Recommendation	Notes
Equipment racks	Rack-mounted UPS and surge protection	Recommended for all audiovisual racks to prevent outages
Wall-mounted displays/projectors	1 outlet per display/projector	Positioned per courtroom layout
Opposite jury box display	Dedicated electrical circuit	Jury-facing display
Behind judge display	Dedicated electrical circuit	Audience-facing display
Judge's bench	Dedicated electrical circuit	For personal display and annotation
Witness stand	Dedicated electrical circuit	For personal display and annotation
Counsel tables	2 electrical outlets per table	Supports laptops and video encoders/displays
In-floor boxes	Multiple connectors and power sources	Sized for current and future cabling needs
Court-provided office areas	Dedicated electrical outlets	For court reporters, interpreters, and other court staff working outside the courtroom

Table 10. Summary of network recommendations

Category	Recommendations
Network switch	Equip each courtroom with a 48-port switch. Install in data closet if available; if not, install in courtroom using fan-less switch. Use port-channel uplink when possible.
Network traffic	Isolate audio/video traffic from court's broader network to prevent performance degradation.
Cooling requirements	Ensure adequate cooling in IDF closets for optimal equipment performance.
Cable management	Minimize visible wires. Place outlets strategically. Subfloor conduits are recommended; if not feasible, use multi-channel cable trays. Label connections and use protective enclosures. Consider modular cabling systems.

Table 11. Summary of courtroom technology management best practices and recommendations

Best practice	Objective	Recommended frequency
Routine updates	Minimize vulnerabilities and optimize system performance	Monthly for software; annually for hardware
System monitoring and diagnostics	Detect anomalies early and prevent system failures	Continuous (24/7 monitoring)
Redundancy and backup systems	Ensure rapid recovery and uninterrupted operation	Quarterly review; after major updates
Power management (UPS and surge protection)	Protect equipment from power loss and surges	Continuous; UPS battery check every 6 months
Access control and security	Prevent unauthorized changes and maintain system integrity	Ongoing; audit quarterly
Documentation and configuration management	Maintain accurate records for troubleshooting and upgrades	Update after every change or upgrade
Staff training and support	Equip personnel to operate and troubleshoot systems	Initial training and semi-annual refresh
Scheduled preventive maintenance	Identify and replace aging components before failure	Semi-annual inspections
Disaster recovery planning	Enable quick restoration after major disruptions	Annual review and testing

Appendix B: Participant Checklist for Judicial Council Minimum Technology Requirements for Remote Proceedings

The Judicial Council's remote technology requirements can be found here:

courts.ca.gov/system/files/file/minimum-technology-standards-20240401.pdf

For convenience, this document has been reorganized to present functional requirements by participant role. This structure may be useful when auditing existing systems and to specify new systems that comply with these standards.

Judicial Officers

- A courtroom must have access to a hard-wired or other reliable high-speed internet connections.
- A courtroom must have monitors, dedicated cameras, speakers, and microphones so the judicial officer, court reporter, and court interpreter can hear and see remote participant (if remote participant has video capability).
- Court-provided microphones must have a mute or off function.
- Microphones must allow a participant to hear, and be heard by, all other participants when necessary.
- Court-provided monitors must allow participants to see (if remote participant has video capability) and identify the participant who is speaking.
- Court technology must provide participants with the capability to alert the court to behavior that is disruptive and may not be visible to all.
- Court technology must provide the ability for the judicial officer or designated courtroom staff to mute or remove from the remote proceeding any remote participant or any unauthorized person who joins the remote proceeding.
- Court-provided speaker equipment must be of sufficient clarity so that the judicial officer and all other participants may hear one another when necessary.
- Court technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to hear and be heard by remote participants, as well as to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute.

Court Staff

- Court-provided microphones must have a mute or off function.
- Microphones must allow a participant to hear, and be heard by, all other participants when necessary.
- Court-provided monitors must allow participants to see and identify the participant who is speaking (if remote participant has video capability).
- Court technology must provide participants with the capability to alert the court to behavior that is disruptive and may not be visible to all.

- Court technology must provide the ability for the judicial officer or designated courtroom staff to mute or remove from the remote proceeding any remote participant or any unauthorized person who joins the remote proceeding.
- Court-provided speaker equipment must be of sufficient clarity so that the judicial officer and all other participants may hear one another when necessary.
- Court technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to hear and be heard by remote participants, as well as to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute.

Court Reporters

- A courtroom must have access to a hard-wired or other reliable high-speed internet connection.
- A courtroom must have monitors, dedicated cameras, speakers, and microphones so the judicial officer, court reporter, and court interpreter can hear and see remote participant (if remote participant has video capability).
- Court-provided microphones must have a mute or off function.
- Court-provided monitors must allow participants to see and identify the participant who is speaking (if remote participant has video capability).
- Court technology must provide participants with the capability to alert the court to behavior that is disruptive and may not be visible to all.
- Court-provided speaker equipment must be of sufficient clarity so that the judicial officer and all other participants may hear one another when necessary.
- Court technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to hear and be heard by remote participants, as well as to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute.

Court Interpreters

- A courtroom must have monitors, dedicated cameras, speakers, and microphones so the judicial officer, court reporter, and court interpreter can hear and see remote participant (if remote participant has video capability).
- Court-provided microphones must have a mute or off function.
- Court-provided monitors must allow participants to see and identify the participant who is speaking.
- Court technology must provide participants with the capability to alert the court to behavior that is disruptive and may not be visible to all.
- Court-provided speaker equipment must be of sufficient clarity so that the judicial officer and all other participants may hear one another when necessary.

- Court technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to hear and be heard by remote participants, as well as to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute.

Remote Participants

- Court technology must provide participants with the capability to alert the court to behavior that is disruptive and may not be visible to all.
- Court technology must allow remote participants to be identified during the proceeding to ensure an accurate record.
- Court-provided speaker equipment must be of sufficient clarity so that the judicial officer and all other participants may hear one another when necessary.
- Court technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to hear and be heard by remote participants, as well as to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute.

Parties, Attorneys, Witnesses, and Jurors

- Court-provided microphones must have a mute or off function.
- Microphones must allow a participant to hear, and be heard by, all other participants when necessary.
- Court technology must provide participants with the capability to alert the court to behavior that is disruptive and may not be visible to all.
- Court-provided speaker equipment must be of sufficient clarity so that the judicial officer and all other participants may hear one another when necessary.
- Court technology must be capable of allowing the judicial officer and all other participants attending the proceeding in person to hear and be heard by remote participants, as well as to see and be seen by remote participants who are capable of using video if the court orders the proceeding to be conducted using video, or as required or allowed by statute.

Appendix C: References

The following references were consulted during the development of this standard.

Assembly Bill 3013 (Remote court reporting), legiscan.com/CA/text/AB3013/id/2962716

Assembly Bill 716 (Open access), legiscan.com/CA/text/AB716/id/2348795

California Rules of Court, rule 3.672 (Remote proceedings),
courts.ca.gov/cms/rules/index/three/rule3_672

California Trial Court Facilities Standards: 2023 Edition,
courts.ca.gov/system/files/file/2023_ctcfs_24_09_19.pdf

Minimum Technology Standards for Remote Proceedings (SB 133),
courts.ca.gov/system/files/file/minimum-technology-standards-20240401.pdf

Report of the Advancing the Hybrid Courtroom Workstream: Findings and Recommendation, courts.ca.gov/sites/default/files/courts/default/2024-12/advancing-the-hybrid-courtroom-workstream.pdf

Tactical Plan for Technology 2025–2026, courts.ca.gov/system/files/file/jctc-court-technology-tactical-plan_0.pdf

Strategic Plan for Technology 2023–2026, courts.ca.gov/system/files/file/jctc-court-technology-strategic-plan.pdf

The Strategic Plan for California’s Judicial Branch, courts.ca.gov/policy-administration/judicial-council/judicial-branch-strategic-plan

Appendix D: Courtroom Technology Compliance and Facilities Guidance

Department of Industrial Relations

Any project with a total cost exceeding the specified thresholds must be registered with the Department of Industrial Relations (DIR), and registration must be completed before any construction activities begin. The cost thresholds are:

- \$25,000 for new projects; and
- \$15,000 for maintenance projects.

These requirements apply only to labor subject to prevailing wage regulations. Transactions involving equipment-only sales are exempt from DIR registration. Compliance with these requirements ensures adherence to state labor laws and avoids potential delays or penalties.

For assistance with DIR registration, courts may:

- Contact the Judicial Council of California Facilities Risk Management Unit via facilities@jud.ca.gov; or
- Visit the DIR website directly at services.dir.ca.gov/gsp

Hazardous Materials Considerations

Both older and newer buildings may contain asbestos or other hazardous materials. Testing is required for any area that will be disturbed by construction activities, including drilling, mounting, or tile removal. If previous testing reports are available, they may be reused.

The site's facilities management administrator can assist with accessing prior reports, coordinating remediation work, and addressing other hazardous materials such as lead-based paint. For additional support related to hazardous materials, contact the Risk Management Unit at JCC-EHS@jud.ca.gov

Building Permit and Inspection Requirements

Certain scopes of work require permits and inspections to ensure compliance with safety and building standards. These include:

- Rated wall penetrations involving the Office of the State Fire Marshal (OSFM);
- Cable runs through fire-stopped conduit;
- Installation of overweight ceiling or wall-mounted equipment;
- Creation of new conduit or cable pathways; and
- Any modifications to the facility.

The Facilities Quality Compliance Unit can provide guidance and support for permit and inspection requirements. For assistance, contact the unit via facilities@jud.ca.gov or reach out to Michael Iarossi at michael.iarossi@jud.ca.gov

Additional scopes requiring permits and inspections include:

- Raised flooring systems, which may involve OSFM, the Department of the State Architect, and Judicial Council Facilities permit requirements, as well as compliance with California Building Code section 11B-303.4 regarding level changes; and
- Conduit and cable pathways through stairwells, which are prohibited under California Building Code section 1023.5.

Scopes that typically do not require permits or inspections include:

- Rack-mounted equipment;
- Desktop-mounted or seated equipment;
- Cable patching using existing data ports; and
- Non-invasive work.

Court-Funded Facilities Request

If the scope of work requires it, the Court-Funded Facilities Request process must be followed. As part of this process, a service work order will need to be generated for the vendor. For detailed instructions and requirements, refer to the Court-Funded Facilities Request Policy available at courts.ca.gov/system/files/file/court-funded-facilities-request-policy.pdf

Ongoing Maintenance

The court is responsible for the maintenance, repair, and replacement of all audio-visual equipment. The Judicial Council does not have recurring funding allocated for audiovisual equipment maintenance or refresh, so courts must plan and budget accordingly.

For detailed guidance, refer to the official *Guidelines for the Responsibility of Facilities Costs between the Judicial Council and Trial Courts* available at courts.ca.gov/system/files/facilities-funding-responsibility-guidelines.pdf.

Appendix E: Project Planning and Budgeting

Project costs vary considerably depending on the specific requirements of each court, the scope of construction involved, and the components selected. For assistance with planning and budgeting, please contact Judicial Council Remote Proceedings at remoteproceedings@jud.ca.gov to review project specifications and discuss available options.