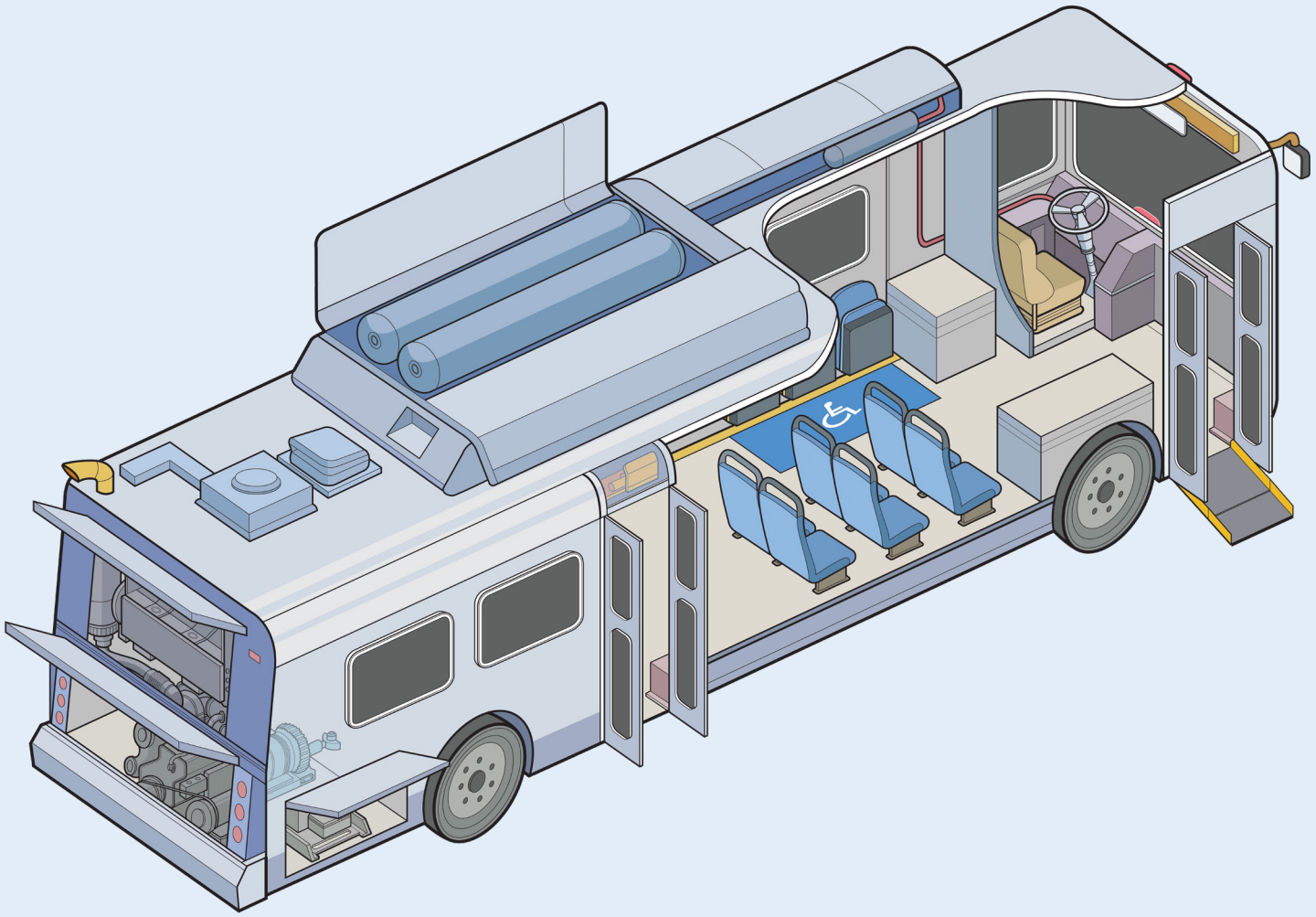
American
Public Transportation
Association



Bus Manufacturing Task Force 2.0

December 2025

Executive Summary

APTA'S BUS MANUFACTURING TASK Force 2.0 was established in May 2025 to recommend approaches for procuring a more standardized U.S. transit bus fleet. By doing so, the public transit industry can help to stabilize and reduce the cost of procuring buses while strengthening the financial health and competitiveness of the supply chain.

The Task Force builds on the reforms recommended by the 2023-24 APTA Bus Manufacturing Task Force, which improved bus manufacturer cash flow through the use of progress payments and inflation-adjusted pricing.

The Task Force, chaired by Randy Clarke, General Manager and CEO, Washington Metropolitan Area Transit Authority (WMATA), and Michelle Allison, General Manager, King County Metro, Seattle, Washington, found that deviations from the industry's bus procurement template (the APTA Standard Bus Procurement Guidelines or "White Book") and elective, agency-specific customization drive higher costs, fragment supplier volumes, and trigger contractual disputes—ultimately increasing prices and extending lead times.

Task Force 2.0 has focused on standardizing designs and practices to support greater consistency across procurements, which will lead to economies in production and a stronger, more competitive supply chain. The Task Force recommendations will be incorporated into the White Book in early 2026. In addition, APTA member bus manufacturers will seek to include the recommendations into their configuration for a "standard" bus, which configuration the Federal Transit Administration (FTA) has used in the past in the scoring of competitive bus grants. APTA will engage in industry training on the new recommendations and seek FTA support for encouraging greater use of the White Book and the Task Force recommended changes in future discretionary bus programs.

Key Recommendations include:

Commercial Terms & Conditions: Encouraging/incentivizing use of the White Book as the default commercial and technical framework for price validity/escalation, fleet defects, excusable delays/LDs, changes in law, warranty, performance guarantees, stop work, insurance, terms, and IP/data rights and minimizing deviations to only those required by safety, law, or essential operations.

Inspections & Acceptance: Establishing minimum inspector qualifications, using standardized inspection/acceptance checklists, conducting pre-award plant tours, and requiring use of a pilot bus on larger orders.

Cybersecurity: Adding a comprehensive White Book section aligning with industry best practices, including threat/risk assessment, program governance, segmentation of passenger convenience networks, testing, and selection guidance.

Vehicle Component Customization: Reducing procurement alternatives to encourage use of common, volume-supported designs. The Task Force has made specific recommendations to standardize the selection of windows, doors, and floor layouts. The manufacturers will seek to incorporate designs into the "standard" bus configurations they offer for advantaged scoring by FTA for competitive bus grants.

Implementation: Partnering with FTA to encourage and incentivize use of the updated White Book provisions. In addition, APTA will sponsor workshops/sessions throughout 2026 to educate transit agencies on the benefits to agencies and the transit industry on use of the White Book for bus procurements.

Introduction

THE POST-PANDEMIC BUSINESS environment has been challenging for bus manufacturers, component and system suppliers, and transit agency customers. Inflation and supply-chain disruptions have driven significant price increases and delayed vehicle deliveries. The long-running transition to zero-emission propulsion has slowed mid-stream. Trade and tariff disruptions have further affected material availability and manufacturing costs.

In 2023, to address procurement practices that were constraining cash flow at major bus manufacturers—and contributing to bankruptcies and market exits—APTA created the Bus Manufacturing Task Force. The Task Force recommended revisions to transit agency procurement and payment practices to stabilize manufacturer cash flow. These recommendations were endorsed by FTA in February 2024 through a "Dear Colleague" letter and accompanying clarifications to federal procurement regulations and guidance. APTA incorporated these changes into its Standard Bus Procurement Guidelines ("White Book"), a consensus-developed model for RFP, contract, and technical specifications used, in whole or in part, by most U.S. transit agencies to procure buses.

One issue not directly addressed by the first Task Force is the impact of bus customization on pricing and production timelines. Local branding preferences, interior layout variations, unique window or door configurations, and specialized components all contribute to buses being built to highly individualized specifications. These differences can substantially increase cost and production complexity. FTA, which funds up to 80 percent of eligible bus purchases, along with the bus manufacturers, has consistently encouraged greater standardization of bus designs across agencies to improve cost stability, reduce production time, and strengthen supply-chain efficiency.

In response, APTA Chair MJ Maynard-Carey, CEO, Regional Transportation Commission of Southern Nevada, Las Vegas, established the Bus Manufacturing Task Force 2.0, chaired by Randy Clarke, General Manager and CEO, Washington Metropolitan Area Transit Authority (WMATA) and Vice Chair Michelle Allison, General Manager, King County Metro. The Task Force includes a broad cross-section of transit agencies, bus manufacturers, and component suppliers. Its focus has been to develop recommendations to support a more standardized U.S. transit bus fleet. Increased standardization can enable economies of scale, stabilize supply chains, strengthen competition, and encourage new market entrants. The recommendations of Task Force 2.0 are detailed in this report.

Standard Bus Procurement Guidelines

THE APTA STANDARD BUS Procurement Guidelines—the White Book—provide transit agencies, bus manufacturers, and bus-parts suppliers with a common template for bus procurements. Built on industry consensus developed over some 40 years, the White Book seeks to provide:

- Complete contract terms and conditions that fairly allocate risk between the transit-agency buyer and the bus manufacturer.
- Technical requirements based on performance specifications that encourage competition.
- A limited number of component and configuration alternatives for bus systems that reflect the different operational needs of transit agencies across the U.S.
- A process for frequent updates to address changes in technology and law.

The White Book is well understood across the industry. It is updated as industry consensus changes, with the goal of reflecting current conditions and industry risk profiles. Buses procured based on its contract terms and technical specifications typically cost less and may be delivered faster than buses procured under transit-agency-developed specifications. Transit agencies often use the White Book as the starting point for procurements. However, deviations from the White Book—and the resulting customization—can lead to significant price increases, delays, and friction between the purchasing transit agency and the bus manufacturer.

Customization

THE U.S. TRANSIT BUS MARKET IS relatively small, with annual purchases of under approximately 4,500 buses per year—compared to more than 40,000 per year in Europe. Buses are produced in multiple lengths and across several propulsion platforms, including diesel, battery-electric, hydrogen fuel cell, compressed natural gas (CNG), trolley, and hybrid-electric. Federal Buy America requirements strictly limit the use of foreign-manufactured components and materials for buses procured using federal funding. These market limitations greatly impact bus pricing: transit agencies cannot use federal funds to purchase lower-cost buses or components from many non-U.S. suppliers; and the limited size of the domestic market restricts economies of scale in manufacturing and parts supply.

In this environment, agency-specific customization—such as alternate window shapes, unique seating layouts, or specialty security and wiring systems—adds cost by requiring additional engineering, low-volume manufacturing of specialized components, increased supplier coordination, and higher inventory complexity.

It is important to distinguish customization from design options driven by specific operational needs. Climate and geography, for example, drive legitimate variation: buses in Miami may require larger cooling systems than those in Fairbanks, Alaska; agencies in high-sun regions may require stronger window tinting. Similarly, accessibility configurations (e.g., kneeling location, ramp placement) must match route and curb designs. Manufacturers already offer standardized options to address these needs, and these are included in the White Book.

Customization occurs when requirements move beyond standard, offered options. Examples include specifying a unique interior color shade; mandating a proprietary window design; or requesting an atypical floor plan that requires re-engineering of HVAC ducts, wiring harnesses, or door locations. These changes often necessitate custom fabrication, smaller supplier pools, and revalidation of safety and performance standards—substantially increasing production cost and schedule risk.

Customization can also occur with unique contract terms and conditions. The APTA White Book provides a set of commercial terms that are widely accepted in the industry and recognize a consensus view on allocation of risk between transit-agency buyers and manufacturers/suppliers. When that consensus changes, the APTA standards process supports White Book revisions to bring the template into alignment with industry practice. This took place, for example, after the APTA Manufacturing Bus Task Force recommended the use of progress payments in lieu of pay-upon-delivery, which had been the common practice. The White Book payment terms were updated and many transit agencies now incorporate those changes. When agencies impose additional warranty, liability, or performance requirements outside the standard framework, manufacturers must price in that additional risk, which can increase costs and delay delivery.

Bus Manufacturing Task Force 2.0

THE BUS MANUFACTURING TASK Force 2.0 was created in May 2025 by APTA Chair MJ Maynard-Carey. The list of its members—transit agencies, bus manufacturers, and bus component suppliers—is included as Appendix 1. Under the leadership of Randy Clarke and Michelle Allison, the Task Force met several times in 2025 to develop recommendations for encouraging the procurement of a more standardized bus. Six working groups, consisting of a broad mix of Task Force and other APTA members, were created to focus on specific aspects of the procurement process. These include the following:

1. **Contract Terms & Conditions:** This working group, led by Jerry Guaracino of WMATA and Jennifer McNeill from NFI/New Flyer, focused on identifying the top ten contractual "pain points" resulting from transit-agency variations in contract terms and conditions and recommending approaches for amelioration.
2. **Inspections and Acceptance:** This working group, led by Andy Skabowski of CapMetro, Austin, Texas, was asked to recommend ways to make vehicle inspections during the manufacturing process and vehicle acceptance more consistent across transit-agency procurements. This might include shared inspectors across multiple transit agencies and more objective standards for accepting or rejecting vehicles.
3. **Cybersecurity:** The White Book lacks a comprehensive approach to cybersecurity. This working group, led by Jerry Guaracino at WMATA, was asked to recommend an integrated approach to cybersecurity across the procurement process.
4. **Vehicle Customization:** Three working groups were created to recommend ways to reduce customization in key areas of the bus design: windows, doors, and floor layouts/seats:

   Window Designs: led by Tom Klos of AROW Global.

   Doors: led by John Condon of Wabtec/VAPOR.

   Floor Layouts and Seating: led by Ray Melleady of Ster Seating. This group examined standardizing floor layouts for different bus lengths as well as a universal approach for seat attachments.

Members of each Working Group are listed in Appendix 1.

The working group recommendations, detailed below and in Appendix 2, provide the guidance and/or specific language for changes to the White Book that, if applied, would result in more consistency in bus design across the industry. This can lead to a more predictable procurement process and the opportunity to generate economies in both the pricing of bus components and inventory/after-market supplies.

Working Group Recommendations

THE WORKING GROUP recommendations, approved by the full Task Force, provide a detailed map for changes to the procurement process that can result in more consistency across bus procurements. In most cases, the recommendations will be used by the APTA Standard Bus Procurement Guidelines Working Group—a standing APTA group charged with updating the White Book—to make revisions to the White Book. This process will be completed in early 2026.

The detailed recommendations can be found in Appendix 2.

APTA will work with FTA to identify approaches for encouraging the use of these new White Book provisions in future procurements. In addition, APTA will provide workshops and sessions at 2026 APTA meetings to detail these changes to APTA members.

The working groups reviewed current practices, identified resulting adverse impacts, and made recommendations for changes to support more consistent and less expensive procurements.

Contract Terms & Conditions

The goal of the Contract Terms & Conditions Working Group was to identify key contractual terms that have become "pain points" during the procurement process and that often drive significant cost or transfer unreasonable risk. For each of these, the Working Group sought to provide "Best Practice" recommendations that would reduce or eliminate these pain points.

The approach followed was to compare industry procurement practices outside the White Book with those using the White Book over the past seven years, rank the top ten contract clauses that result in the most cost or schedule impacts or risks, and detail how use of the White Book could reduce cost or risk to bus manufacturing contracts.

Current Industry Practice

The Working Group found that bus procurement terms and conditions have become increasingly complex, including provisions that transfer uncapped risk to the bus manufacturer. These include risks associated with inflation, supply disruption, technology adoption, work stoppages, and component reliability. In many cases, the manufacturer has limited control over mitigating the risks transferred within the contract term and therefore must provision for the insurance, occurrence, or penalties—driving up contract costs and exposing the manufacturer to financial harm.

The top ten pain points include the following:

	Contract Term or Condition	Increases Cost	Increases Risk
1	Price Escalation/Price Validity	Yes	Yes
2	Fleet Defects	Yes	Yes
3	Excusable Delays/ Force Majeure/ Liquidated Damages	Yes	Yes
4	Changes in Law	Yes	Yes
5	Warranty Requirements	Yes	Yes
6	Performance Guarantees	Yes	No
7	Stop Work Requirements	Yes	Yes
8	Insurance	Yes	No
9	Payment Terms	Yes	No
10	Proprietary Rights/ Rights in Data/ Escrow	Yes	Yes

Recommendations

The detailed recommendations of the Working Group are included in Appendix 2. In virtually all cases, the recommended practice is to follow the current (or slightly modified) language already included in the APTA White Book. In some cases, the Working Group recommended small changes to the White Book and/or clarifications. These changes can be made by the APTA Standard Bus Procurement Guidelines Working Group early next year.

The Task Force urges APTA and FTA to identify ways to incentivize the use of the White Book, particularly with regard to these difficult and potentially expensive contract provisions.

Inspections & Acceptance

Manufacturing a modern transit bus is a complex process involving thousands of parts and hundreds of suppliers. Buses on the production line may include different propulsion systems, structural elements, floor layouts, seats, and security and fare-collection systems. To protect the buyer's interests as the bus proceeds along the production line, transit agencies utilize inspectors who remain in the plant to ensure the bus under manufacture meets the requirements of the specification. FTA also requires on-site inspectors for procurements in excess of 10 buses (49 CFR Part 663). Once the bus is completed, the vehicle undergoes an acceptance process to ensure that it meets the buyer's expectations and contractual requirements.

Current Industry Practice

APTA issued a Recommended Practice for In-Plant Inspection for Bus Procurements (APTA BTS-II-RP-001-11) in 2011, but this recommended practice has not been updated. Inspections and acceptance differ by agency, and there is often little consistency across the industry. Inspectors often differ from one another in terms of experience, education, and training, and what is acceptable to one may not be to another. Similarly, acceptance of the vehicle can be highly subjective, with some agencies withholding major payment amounts for what might be arbitrary or minor non-conformances. Acceptance delays can be a major source of conflict between transit agencies and bus manufacturers, often resulting in delays or claims against each other.

Recommendations

The Working Group recommended a series of steps to ensure a common understanding of expectations for all parties in the procurement and to set minimum requirements to serve as an inspector. It also recommended development of a standard checklist for vehicle acceptance. These steps would result in more consistency across procurements and fewer disputes and delays.

- **Minimum Standard for Inspectors:** The White Book should include minimum requirements for the education, training, and knowledge of inspectors for specific types of inspections, whether the inspector comes from a transit agency or from a third-party inspection team. Smaller agencies should be encouraged to use third-party inspection firms if they lack staff who meet the new standards.
- **Inspection and Quality Guidelines:** The White Book should include updated recommended practices or guidelines for inspections, quality, and vehicle acceptance. RFP documents should then set forth the expectations of the transit agency regarding these issues, enabling manufacturers to seek alignment with those expectations or to take exception to them.
- **Plant Tour:** It should be industry practice for transit agency staff to take plant tours as part of the RFP process to ensure there is an understanding of the workflow of the plant and how delivery of the bus is impacted by changes or issues during the manufacturing process.
- **Pilot Bus:** The White Book should encourage or incentivize the use of pilot buses on any bus purchases of over 20 buses. While this could impact lead time, it would help to expedite the inspection and acceptance processes and to minimize disputes.

Cybersecurity

Today's bus includes many state-of-the-art technologies and systems that regulate and monitor bus operations and performance, support communications and vehicle location systems, facilitate on-board Wi-Fi and communications, and manage fare collections. With every new connected technology that relies on data or communications transmissions comes the threat of cybersecurity breaches and the need for cybersecurity vigilance and protection.

Current Industry Practice

APTA and other standards development organizations have produced important cybersecurity standards and best practices that enable transit agencies and technology suppliers to protect against cyber-attacks and interference. However, there is no overall cybersecurity standard that integrates protection across all systems included on a bus.

Recommendations

The Working Group recommended that the White Book be updated to include a comprehensive section on cybersecurity. The Task Force supports this recommendation. The new section should reference existing applicable APTA and industry cybersecurity standards and best practices and add new provisions that address:

- Agency threat and risk assessment.
- Cybersecurity program and project management.
- Physical security measures.
- Segmentation of passenger convenience systems (seat USB, Wi-Fi) from coach systems.
- Testing and analysis of cybersecurity.
- Instructions for selecting additional cybersecurity requirements based on threat and risk assessment.

Vehicle Customization

The White Book is designed to recommend a default technical specification and possible alternatives to address specific transit agency needs. Most agencies choose from among these options. However, some agencies insist on specific bus components or systems, either from specific manufacturers or to meet a unique need of the agency. An agency, for example, may insist on a larger battery or a specific atypical floor plan or a technology that requires rerouting of cables and unique brackets. Not only do these unique components add to the cost of the bus, they reduce demand for more standardized products, diminishing economies of scale that could benefit the entire industry.

The Task Force directed the three customization working groups—windows, doors, and floor layouts/seating—to review past procurements to determine the 3-5 most commonly procured designs and to recommend changes to the White Book that would support use of those common component designs. If more transit agencies were to procure buses with these common components, the industry could move toward the goal of a standard bus. This would help to stabilize and strengthen the supply chain, facilitate larger and presumably less-costly production runs, and make it easier for new market entrants.

The three Working Groups achieved the directive. Their detailed recommendations are included in Appendix 2 and summarized below. The Task Force recommends that the White Book be updated to support these recommendations.

Windows: The Working Group found that the White Book's window specifications are overly complex and include too many options that can lead to non-standard windows, increasing cost and inventory and after-market procurement challenges. In addition, some agencies insist on unique legacy window designs because "that is what we have always ordered in the past." The Group recommended the following White Book changes:

- **Driver's window:** Specify glazing that is most commonly procured and legally acceptable.

- **Passenger windows:** Reduce the passenger-side window configuration options to the four most common options (traditional or bonded, full-fixed or inward-opening transom).
- **Materials:** Clearly specify the combination of materials that yield a standard product in the DEFAULT section of the specification.
- **Solar management:** Clearly specify an SHGC and light-transmittance combination that allows for more common solar-management glass to be utilized consistently.

The Working Group's detailed recommendations and suggested White Book changes are included in Appendix 2.

Doors: After reviewing recent procurements, the Working Group concluded that few high-volume standard components are currently used. This is due to both unique manufacturer vehicle structures and transit-agency-driven operational and legacy requirements. The Working Group recommended that the White Book be updated to:

- Better organize, clarify, and consolidate technical guidelines, clearly identifying recommended default standards.
- Eliminate low-use alternatives.
- Add new sections to more clearly define default standards for door types, door obstructions, and door controls.

The Working Group's detailed recommendations and suggested White Book changes are included in Appendix 2.

Floor Layouts: The unique branding and operational demands of transit agencies often impact the layout of the bus interior. The floor plan, in turn, impacts a multitude of other systems—from the location of HVAC ducts and grab bars to seat-mounting brackets and door and window designs. Unique floor plans can require significant additional engineering to integrate these systems, resulting in additional costs and time, which can cascade across the supply chain. This often results in extended engineering cycles due to iterative clarification and re-engineering processes.

The Working Group concluded that a common layout for each bus size could result in significant benefits. These include faster layout-engineering cycle times through first-time-right specifications, reduced engineering iterations and rework across all parties, and improved lead times from specification receipt to delivery. These benefits would result in lower overall project costs through elimination of change orders and corrections.

The Working Group endorsed the use of a specific floor layout for 35-foot, 40-foot, 45-foot, and 60-foot buses and provided standard specification templates for each. These would be added to the White Book as default bus layouts, with additional related specifications as needed. The use of a common floor layout—more than any other single change to current practice—would offer the greatest opportunity for cost and time savings.

The recommended floor plans are included as Appendix 2.

Conclusion

THE BUS MANUFACTURING TASK Force 2.0 has identified practical, consensus-driven actions to reduce cost, shorten schedules, and strengthen the resilience of the U.S. transit bus manufacturing ecosystem. By minimizing elective customization and aligning on default standards—while preserving necessary operational options—agencies and manufacturers can unlock economies of scale, stabilize domestic supply chains, and attract new market entrants. With FTA partnership and timely White Book updates targeted for early 2026, the industry is positioned to implement these recommendations through consistent procurement practices, consistent inspections and acceptance processes, modernized cybersecurity requirements, and streamlined component and layout selections. Collectively, these measures will support reliable, affordable, and sustainable bus manufacturing capacity to meet evolving mobility needs across the United States.

APPENDIX 1
American Public Transportation Association Bus Manufacturing Task Force Members

Name	Organization
Randy Clarke, Chair	WMATA
Michelle Allison, Vice Chair	King County Metro
Joel Young	AC Transit
Salvador Llamas	AC Transit
Dawn Distler	Akron METRO
Paul P. Skoutelas	APTA
John Hroncich	BAE
Buddy Coleman	Clever Devices
Debra Johnson	Denver RTD
Dan Trujillo	El Dorado Bus
John Obert	El Dorado Bus
Ben Grunat	GILLIG
Bill Fay	GILLIG
William Haber	King County Metro
MJ Maynard-Carey	RTC Southern Nevada
Jennifer McNeill	NFI
Stephanie Laubenstein	NFI
Geoff Ray	NYMTA
Daniel Cardoza	NYMTA
Antonio Torcia	Solaris Bus
Ray Melleady	Ster Seating
Beth Holbrook	UTA
James Harper, ex officio	FTA
Dana Nifosi, ex officio	FTA
Matt Welbes, ex officio	FTA
Kimberly Feldbauer, Staff	WMATA
Eric Bustos, Staff	WMATA
David Carol, Staff	APTA

APTA Bus Manufacturing Task Force 2.0 Working Groups

Working Group	Name	Organization
Contract Terms & Conditions	Jerry Guaracino	WMATA
	William Haber	King County Metro
	Jennifer McNeill	NFI/New Flyer
	Bill Fay	GILLIG
	Antonio Torcia	Solaris Bus
	Dan Trujillo	El Dorado Bus
Inspections/Acceptance	Andrew Sabowski	CapMetro
	Salvador Llamas	AC Transit
	Jarrot Hampshire	Akron METRO
Cybersecurity	Jerry Guaracino	WMATA
	Joel Waugh	WMATA
	William Haber	King County Metro
	Christos Karanicolas	Clever Devices
	Mitch Hall	Clever Devices
Windows	Tom Klos	AROW Global
	John Condon	Wabtec/RICON
	William Haber	King County Metro
Doors	John Condon	Wabtec/VAPOR
	Bas de Nooijer	Ventura
	William Haber	King County Metro
	Frank Golemis	Ventura Systems
	Joshua Alexander	King County Metro
	Kevon Johnson	King County Metro
	Sophon Ly	King County Metro
Floor Layout / Seats	Ray Melleady	Ster Seating
	David Wolf	American Seating
	Stan Brzezniak	Freedman

APPENDIX 2
1. Bus Manufacturing Task Force 2.0 Working Group Recommendations

Contract Terms & Conditions Working Group

Terms and Conditions

SUBCOMMITTEE GOAL

Identify key contractual terms that have become "pain points" during procurements which:

- Often Drive Significant Cost
- Often Transfer Unreasonable Risk

Provide "Best Practice" recommendations that will reduce the cost of bus procurements and improve the health of bus manufacturers.

APPROACH

Comparison of Industry Procurements vs. APTA White Book over the past 7 years

- Rank top 10 contract clauses
- Provide Best Practice recommendation
- Provide description of how adopting Best Practice language could reduce cost or risk to bus manufacturing contracts.

Key Consideration and Care to Describe Process Avoiding Competition Sensitive Material and Provide Publicly Available Support Statistics

KEY FINDINGS

Over the last decade, bus procurement terms and conditions have become increasingly complex, including provisions that transfer uncapped risk to the bus manufacturer including:

- Inflation Risk
- Supply Disruption Risk
- Technology Adoption Risk
- Work Stoppage Risk
- Component Reliability Risk

In many cases, the manufacturer has limited control over mitigating the risks transferred within the contract term, and therefore is required to provision for the insurance, occurrence or penalties, driving up contract costs and exposing the manufacturer to financial harm.

Top 10 Commercial Terms & Conditions that Drive Significant Cost and/or Transfer Unreasonable Risk

Top 10 Commercial Terms + Conditions	Cost	Risk
1. Price Escalation / Price Validity	✓	✓
2. Fleet Defects	✓	✓
3. Excusable Delays / Force Majeure / Liquidated Damages	✓	✓
4. Changes of Law	✓	✓
5. Warranty Requirements	✓	✗
6. Performance Guarantees	✓	✓
7. Suspension of Work	✓	✓
8. Insurance	✓	✗
9. Payment Terms	✓	✗
10. Operating Range	✓	✓

Top 10 Commercial Terms + Conditions

1. Price Escalation / Price Validity

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	• Base Prices may be fixed for 12 to 24 months from contract award. • Option Prices are escalated at the time the Agency notifies the Contractor that they wish to exercise options. • Option Quantities sometimes spanning multiple build years or placed years in advance of production.	• Contractor takes on risk of inflation from the point of bid submission / Notice of Exercise of Option to the point of line entry, including delays in contract award and issuing Purchase Orders for base awards. • Most contracts do not include price escalation terms for option orders that span multiple years or are placed early to align fleet plans with future deliveries.	Contractor estimates inflation in base bus price, based on confidence levels in: • Time from bid submission to award date, plus • Time from award date to line entry • Anticipated inflation during that time.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

The price of each vehicle is increased or decreased using PPI escalator at line entry compared to the date of contract execution, with a maximum cap on the base order.

RECOMMENDATION:

Recommend agencies adopt the current default language in the APTA White Book, which calculates inflation at the point at which material is purchased (line entry), which will avoid future inflation being estimated by manufacturer's and included in the base price of vehicles.

Top 10 Commercial Terms + Conditions

2. Fleet Defects

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	Fleet Defect Coverage that includes: • Major Components • Lower Failure Rate Thresholds • No Minimum Fleet Size	• Major Component Suppliers (engines, axles, HVAC etc.) do not offer fleet defect coverage. • Low failure rate thresholds combined with low minimum fleet sizes create more risk.	Contractor must self-insure fleet defect coverage for major components. Contractors provision major component fleet defects without having access to component data or control of the remedy.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

Includes Fleet Defect provisions with 25% failure rate Minimum fleet size of 20 buses Limited to warranty period.

RECOMMENDATION:

- Adjust the APTA White Book language to remove Major Components from the fleet defect language.
- Recommend Agencies adopt the amended language in the White Book which will reduce their overall costs. Agencies can request the price for alternate language as an optional item, allowing Contractors to provide pricing and comments, enabling Agencies to make informed decisions on the price for risk transfer.

Top 10 Commercial Terms + Conditions

3. Excusable Delays / Force Majeure / Liquidated Damages

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	• Liquidated Damages are uncapped, and daily rates charged per Calendar Day. • Excusable Delay language often limited to Force Majeure (acts of god, civil disturbance and war)	• Supply disruption and mitigations unpredictable in the last 5 years. • Component suppliers are often selected by Agencies, restricting Contractor's ability to switch suppliers. • Component suppliers typically do not accept flow-down of Liquidated Damages provisions.	• Contractor's provision for the cost of liquidated damages based on the components selected, supplier performance, and risk with the required • Agencies deduct LD's from bus payments before full negotiation or information on the delay has been communicated and negotiated

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

Includes Liquidated Damages provisions excluding Excusable Delays and recommending a cap.

Excusable Delay language includes supply disruption and considers the efforts taken by Contractor to mitigate delays.

RECOMMENDATION:

- Recommend agencies adopt the current language in the APTA White Book specifications and do not deduct Liquidated Damages until claims have been reviewed and negotiated.
- Recommend Agencies outline a clear process for how to claim Excusable Delay and the information required to support and approve a claim.

Top 10 Commercial Terms + Conditions

4. Changes of Law

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	• All rolling stock procurements allow price adjustments due to changes in law after contract award • Changes in Law are not specifically defined. • Confusion around an appropriate process for OEM to claim tariffs and duties imposed.	• Bus Manufacturers assume risk between proposal submission and Contract execution. • Rapidly changing regulatory environment post award. • Undefined Changes in Law creating uncertainty in price adjustments.	Majority of tariff impact in current environment is subcomponents. Component suppliers pass tariff impacts along to Bus OEMs. Without clear definition, Contractors may not bid or may estimate tariff costs which become included in base costs and subject to future price escalation.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

Allows price adjustment due to Changes of Law that become effective after the Proposal due date, with audited backup.

RECOMMENDATION:

- Recommend the APTA White Book specification updates the language to explicitly state that Tariffs and Duties as a Change of Law and that Executive Orders are also included in the definition of a Change of Law.

Top 10 Commercial Terms + Conditions

5. Warranty Requirements

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	Standard Base Warranties, plus: • Increasing levels of component warranty coverage. • Up to 12-year warranties on ESS components • Inclusion of Warranty Liquidated Damages	• Increasing warranty coverage beyond what is available from component manufacturers requires self-insurance by Bus OEM.	Contractor must self-insure warranty coverage beyond what is available from component manufacturer. Contractors provision major component fleet defects without having access to component data or control of the remedy.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

Standard Base Warranties, 2-year Warranties for Most Components, Proposer to provide information on available standard and extended warranties for ESS components. Alternates for extended warranties.

RECOMMENDATION:

- Recommend Agencies adopt the APTA White Book Specification language for warranty.
- Recommend Agencies request the price for alternate warranties as an optional item, allowing Contractor's to provide pricing and comments, enabling Agencies to make informed decisions on the price for risk transfer.

Top 10 Commercial Terms + Conditions

6. Performance Guarantees

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✗	✓	Performance Bond amounts ranging from 5% to 50% of contract value, even when the agency incurred no financial exposure or progress payments. No step-down language to reduce the amount of the bond, as vehicles are delivered.	• Surety provider takes on the risk of (a) Contractor default and (b) finding an alternate Contractor in the event of default. • Bond rates impacted by interest rates, inflation, supply disruption, credit risk and more stringent underwriting criteria.	2014 TRB published a study indicating that the cost of bonding for construction projects ranged between 0.4% to 2.5% of coverage. Bond rates have significantly increased for rolling stock contracts since 2020.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

Default – no liquid or surety Performance Guarantee is required.

Alternative – a performance guarantee is required to a dollar amount (no progress payments), or the amount of financial exposure (progress payments), with step-down language.

RECOMMENDATION:

- Recommend Agencies adopt the default APTA White Book specification language, unless Advance Payments are included.
- Recommend Agencies request the price for a bond as an optional item, allowing Contractor's to provide pricing and comments, enabling Agencies to make informed decisions on the price for risk transfer and assess the value of the surety.

Top 10 Commercial Terms + Conditions

7. Suspension of Work

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	• Agencies have the sole discretion to stop work on a bus contract for a specified period of time.	• Unilateral decision by Agencies to stop work. • Running high weekly production rates puts the manufacturer at risk of shutting down manufacturing lines and laying off employees.	Stop shipment orders create non-productive labor costs, increase carrying costs for work in process and generally disrupts business. Contractors may decide to limit delivery rate commitments based on risk of suspension of work.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

The APTA White Book standard language plus basic criteria for suspension of work for safety related defects, provisions for remedies other than work stoppage, and mutual agreement language.

RECOMMENDATION:

- Recommend the SBPG Working Group draft language with clear criteria for when suspension of work can occur, including mutual agreement language.

Top 10 Commercial Terms + Conditions

8. Insurance

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✗	✓	Includes standard coverages but recent procurements have added: • Increased Insurance Limits • Errors and Omissions Insurance • Cybersecurity Insurance	• Errors and Omissions Insurance is common in construction projects but non-standard in rolling stock projects. • Additional insurance requirements may be expensive or difficult to obtain.	Increased insurance costs may be incurred for the duration of the contract for non-standard coverages.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

Includes standard coverages for Statutory Workers Compensation and Employers Liability insurance, Commercial General Liability Insurance, Bodily Injury and Property Damage, including Contractual Liability, Product Liability and Automobile Liability.

RECOMMENDATION:

- Recommend Agencies request the price for Insurance beyond the basic coverages included in the APTA White Book as optional items, allowing Contractor's to provide pricing and comments, enabling Agencies to make informed decisions on the price for risk transfer.

Top 10 Commercial Terms + Conditions

9. Payment Terms

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✗	✓	• 100% at Acceptance • Certain contracts contain retainage provisions based on time in service or calendar days in service.	• Bus OEM's finance increasingly expensive rolling stock projects. • Retained amounts typically exceed the remedies associated with the reasons for retainage, which are usually covered under warranty.	• Discounts may be provided for advance and progress payments, reflecting carrying costs for financing the projects. • Carrying costs for retainage increase the bus price.

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

4 Payment Alternatives:

- 20% PO / 60% Shipment / 20% Acceptance
- 75% at Engine Install / 25% Acceptance
- 75% Shipment / 25% Acceptance
- 100% Acceptance

RECOMMENDATION:

- Recommend Agencies adopt progress payments as the standard payment term and request the price for alternate terms as an optional item, allowing Contractor's to provide pricing and comments, enabling Agencies to make informed decisions on the price for risk transfer and assess the value of the payment terms to the bus price.

Top 10 Commercial Terms + Conditions

10. Operating Range

Risk	Cost	Industry Practice	Risk Associated with Current Industry Practice	Cost Impact vs. Best Practice
✓	✓	All zero-emission bus contracts have operating range requirements or ESS capacity at end of life. Some recent procurements have added increasingly severe remedies including replacement of battery systems, free vehicles and holdback of price escalation for option orders. Severe remedies are often not fully defined in the contract.	• Operating range and ESS capacity is heavily influenced by duty cycle, geography, ambient temperature, driver behavior and charging rates. • Warranty provisions for severe remedies are often impossible to appropriately calculate, leaving Bus OEM unprotected.	• Costly warranty provisions for ESS capacity at Warrantable End of Life

BEST PRACTICE: APTA WHITE BOOK LANGUAGE

- Includes range requirements for both Altoona-defined profile and Agency-defined profile using analytical methods.
- ESS capacity defined at Warrantable End of Life, and remedy follows standard warranty process.

RECOMMENDATION:

- Recommend Agencies adopt current APTA White Book language and allow Bus OEM's the opportunity to fully describe the performance and operating range of the vehicle in proposals.

Terms and Conditions

Recommendations

A tremendous amount of work has been done by both agencies and business members on the APTA Standard Bus Procurement Guidelines. They represent a balanced best practice that could be immediately adopted. Unfortunately, the APTA SBPG is not used by all agencies.

The Working Group Recommends:

- Increase awareness of the changes to the APTA Standard Bus Procurement Guidelines and benefits of adoption.
- Educate procurement professionals on the impact of the top 10 terms and conditions related to cost and risk.
- Encourage agencies to adopt the APTA Standard Bus Procurement Guidelines for bus procurements
- If alternate terms are desired, encourage Agencies to allow alternate terms to be quoted as optional items.

While the risk transfer of current industry practice may be appropriate in some situations, the subcommittee feels that it is important that agencies understand the cost and impacts of doing so.

Inspections/Acceptance Working Group

Key Issues

- **APTA Recommended Practice:** APTA's In-Plant Inspection for Bus Procurements (APTA BTS-II-RP-001-11) is out-of-date and should be updated.
- **Agency Expectations:** The RFP should set the expectations and risk levels of the OEM's dependence on the agreements.
- **Consistent Uniform Standard** for inspections for all agencies.
- **Established Set of Skills** required knowledge for inspectors
- **Large Agencies:** dedicated full-time inspectors; Smaller Agencies: use Third-Party inspection teams
- **Technical vs Buy America:** Separate technical bus inspections from Buy America compliance
- **Pilot bus** – Keep one bus at the plant to serve as the measure when the agencies and the OEM disagree.
- **Plant Tours** as part of the solicitation process.

Create Governing Document

- **Practices:** Update APTA's In-Plant Inspection for Bus Procurements (APTA BTS-II-RP-001-11)
  - Inspectors (agency and Third-Party):
  - Scope of Work
- Level of training/knowledge
- **Alignment:** Agency inspection program should align with OEM Quality program
- **RFPs:** RFPs should include detailed specifications for the agency's inspection plan that generally align with OEM quality guidelines. This provides the OEMs opportunity to review and provide input during submittals of the RFP response.
- **Plant Tours:** Require plant tours as part of an RFP process
- **Pilot Buses:** Encourage use of pilot buses on any bus purchases of over 20 buses.

Window Standardization Working Group

TS 52 Driver's Side Window

Current White Book Approach: Includes language for driver window glazing that is overly complex (multiple light transmittances at certain dimensions from the floor).

> **Adverse Cost Impact:** *Assumptions about what glazing and window features are required to meet the specification will commonly yield a non-standard offering.*

Recommended Approach: Specify glazing that is most common and legally acceptable for the driver window.

Recommended White Book Language

DEFAULT

Safety Glass Glazing Panels – Traditional Frame

Side windows glazing material shall have a minimum of ¼" nominal thickness laminated safety glass. The material shall be green tint, greater than 70% light transmittance, and conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the recommended practices defined in SAE J673.

Safety Glass Glazing Panels – Hidden Frame (Flush / Bonded Windows)

Side windows glazing material shall have a minimum of 3⁄16 in. nominal thickness tempered safety glass. The material shall green tint, greater than 70% light transmittance, and conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the recommended practices defined in SAE J673.

SHGC and light transmission performance shall be defined by the National Fenestration Rating Council.

TS 53.1 Side Windows Configuration

Current White Book Approach: Allows for six passenger side window configurations, two of which are uncommon (sliders).

> **Adverse Cost Impact:** *Slider windows are the most complex window to make and are made in lower volumes than other configurations. More configurations result in non-standard offerings which affects cost during procurement and in operations as replacement glass is needed.*
>
> *Additionally, lead time to put a bus with broken glass back in service is reduced with standard offerings.*

Recommended Approach: Narrow the passenger side window configuration options to the four most common options (traditional or bonded, full fixed or inward opening transom).

Recommended White Book Language

DEFAULT

Choose one of the following options:

Traditional Frame

- Full fixed
- Openable windows with inward-opening transom panels

Hidden Frame (Flush / Bonded)

- Full fixed
- Openable windows with inward-opening transom panels

QUICK-CHANGE PASSENGER SIDE WINDOWS

Glazing in the window assembly shall be replaceable without removing the window from its installed position on the bus. The window shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

TS 53.4 Materials (Glazing and anti-vandalism options)

Current White Book Approach: Lists DEFAULT and ALTERNATIVE options which must be curated correctly to arrive at a standard product offering (difficult for typical user publishing procurement).

> **Adverse Cost Impact:** *Common scenario is that a new bus procurement will call for all options (subjective to bidder) or for combinations of options which are non-standard.*

Recommended Approach: Clearly specify the combination of materials that yield a standard product in the DEFAULT section (i.e. glazing is ¼" thickness 28% laminated grey tint vs. glazing is laminated)

Recommended White Book Language

DEFAULT

Safety Glass Glazing Panels – Traditional Frame

Side windows glazing material shall have a minimum of ¼" nominal thickness laminated safety glass. The material shall be gray tint, 28% light transmittance, and conform to the requirements of ANSI Z26.1-1996 Test Grouping 3 and the recommended practices defined in SAE J673.

Safety Glass Glazing Panels – Hidden Frame (Flush / Bonded Windows)

Side windows glazing material shall have a minimum of 3⁄16 in. nominal thickness tempered safety glass. The material shall gray tint, 13% light transmittance, and conform to the requirements of ANSI Z26.1-1996 Test Grouping 3 and the recommended practices defined in SAE J673.

SHGC and light transmission performance

shall be defined by the National Fenestration Rating Council.

Other Changes:

- Remove legacy **Alternative** for acrylic glazing
- Correct incorrect specifications for Anti-vandalism film

TS 53.4 Materials (Alternative for Solar Management Glass)

Current White Book Approach: Calls for a solar heat gain coefficient (SHGC) and light transmittance combination that is not easily attainable with common raw materials.

> **Adverse Cost Impact:** *Non-standard materials are generally proposed when bids include the current language and are sometimes still unable to meet the requirement.*

Recommended Approach: Clearly specify a SHGC and light transmittance combination that allows for more common solar management glass to be utilized consistently.

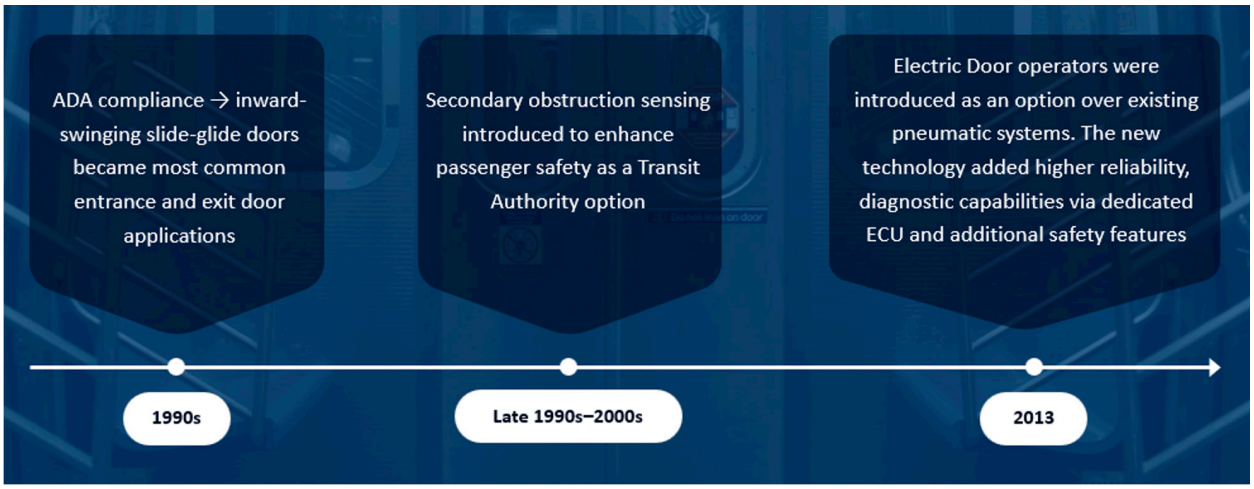
Recommended White Book Language

ALTERNATIVE

All side windows shall be solar management glass with a solar heat gain coefficient (SHGC) of no greater than .59 and a visible light transmission of no less than 70%

Door Standardization Working Group

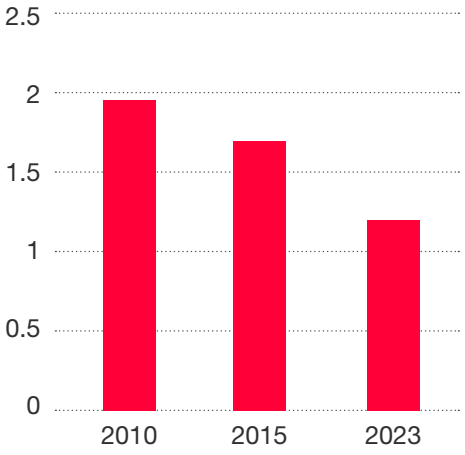
DOOR SYSTEM EVOLUTION - OVER 30 YEARS



PRICE SNAPSHOT - DOORS VS BUS VALUE

- **2010** (Pneumatic door, diesel bus): ~1.95% of vehicle cost
- **– 2015** (Pneumatic door, hybrid bus): ~1.7% of vehicle cost
- **– 2023** (Electric door, BEB bus): ~1.2% of vehicle cost
- **Trend:** Door systems = smaller % of vehicle cost **despite added tech and inflation**

Door System Value as % of Bus Price



2010-2023 Escallation	
Doors	23.40%
Bus	102.80%
F150 XLT	143.10%

WPU1413		
2010	2023	% Increase
215.1	344.27	60%

STANDARDIZATION CHALLENGES

- Volume: Industry builds ~5,000 buses annually → low volume
- OEM-driven customization
  - Unique front doors per OEM (not interchangeable)
  - Rear doors: multiple widths (narrow, medium, wide)
  - OEM decides geometry (slide-glide vs swing)
- TA-driven customization
- Working environment requirements
- Legacy SOP requirements (CTA red ball)
- Operational requirements (rear door boarding)

Component	OEM Options	Standardization Issue
Front Doors	Unique per OEM	Not interchangeable
Read Doors	Widths: narrow, medium, wide	Not interchangeable
Door Geometry	Slide-Glide vs Swing vs Plug	OEM-driven, no common default

COMMITTEE Actions Summary

SBPG Section TS 81 Changes

- Reformatted document to better organize and consolidate technical guidelines Default Standards more easily identified
- Eliminated low use alternatives
- Ensured OEM flexibility preserved
- Added section for door types to clearly define default standards and alternatives
- Added sections to more clearly define door obstructions and door controls to more clearly define default standards and alternatives

Recommended Changes to TS 81 PASSENGER DOORS

1.0 GENERAL REQUIREMENTS

Compliance with all relevant Federal Requirements (ADA, FMVSS, DOT, ANSI, ETC.)

2.0 DOOR LOCATIONS

2.1 Transit Bus Door Locations

2.1.1 Front Door

a) Located forward of front wheels under direct driver observation ***(Default/Standard)***

2.1.2.1 Rear Door

a) Curbside doorway centerline located rearward of the point midway between the front door centerline and the rearmost seat back. (Default/Standard)

b) Curbside doorway located behind the rear axle.

c) Street-side doorway located rearward of the point midway between the front door centerline and the rearmost seat back.

d) Street-side doorway located behind the rear axle.

2.1.3 Articulated Bus Rear Door(s)

a) Curbside doorway located forward of the rear axle of the trailer section.

b) Street-side doorway located forward of the rear axle of the trailer section.

c) Curbside doorway located forward of the center axle.

2.2 Commuter Coach Door Locations

a) Located forward of front wheels under direct driver observation *(Default/Standard)*

3. DOOR OPENING DIMENSIONS

3.1 Transit Bus

a) *(Default/Standard)* Door Height: 75 inches minimum door opening height

b) Door Width Options (see Figure 1):

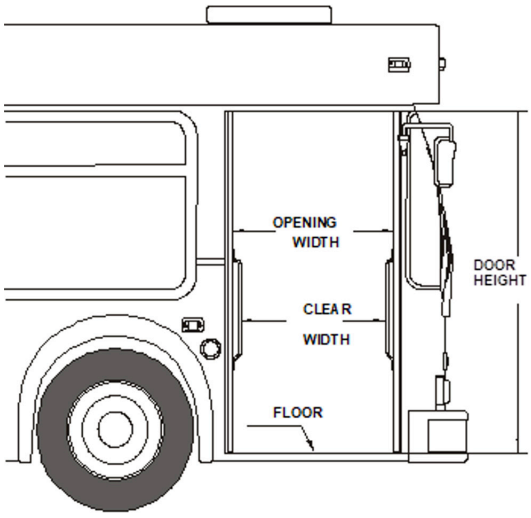


Figure 1 – Transit Bus Door Opening Dimensions

Front Door Clear Width: 31¾ inches minimum in fully open position

Rear Door Clear Width: 24 inches minimum in fully open position.

If a rear door ramp or lift is provided, then the clear door opening width shall be a minimum of 31¾ inches in fully opened position.

(Alternative) Bus OEM specific Front and Rear door width options

3.1 Commuter Coach

Minimum [clear] width shall comply with ADA requirements.

3.2 Door Projection (Transit Bus)

Exterior Projection: The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight of the rear exit door via the curbside mirror when the doors are fully open.

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

Door Height Above Pavement: It shall be possible to open and close either passenger door when the bus, loaded to its gross vehicle weight rating, is not knelt and is parked with tires touching an 8-inch curb so that the street-side wheels are 5 inches higher than the right-side wheels.

4. DOOR EQUIPMENT CONSTRUCTION REQUIREMENTS

4.1 Structure of the doors, their attachments, inside and outside trim panels, and any mechanism exposed to the elements shall be corrosion resistant.

4.2 Door panel construction shall be of corrosion-resistant metal or reinforced nonmetallic composite materials.

When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress with tires touching an 8-inch curb so that the street-side wheels are 5 inches higher than the right-side wheels.

4.3 Structure of the doors, their attachments, inside and outside trim panels, and any mechanism exposed to the elements shall be corrosion resistant.

4.4 Door panel construction shall be of corrosion-resistant metal or reinforced nonmetallic composite materials.

4.5 When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress.

4.6 Door edges shall be sealed to minimize infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment, to the maximum extent possible based on door types.

4.7 The closing edge of each door panel shall have no less than 2 in. of soft weather stripping.

4.8 The doors, when closed, shall be effectively sealed, and the hard surfaces of the doors shall be at least 4 in. apart (not applicable to single doors).

4.9 The combined weather seal and window glazing elements of the front door shall not exceed 10 deg of binocular obstruction of the driver's view through the closed door.

4.10 Door Glazing

a) The upper section of both front and rear doors shall be glazed for no less than 45% of the respective door opening area of each section.

b) Rear Door glazing length

(Default/Standard) full length in one or two sections of glazing

(Alternative) Upper glazing with lower section close out panel

(Alternative) Upper glazing with lower section close out panel with internal kick plate

c) The lower section of the front door shall be glazed for no less than 25% of the door opening area of the section.

d) Glazing material in the rear doorway door panels shall be defined by the Agency.

e) Door glazing shall be easily replaceable.

f) Tint – Ref. N. Radcliffe standard language

(*Default/Standard)* Quick-change glazing exterior frame

(Alternative) Full exterior glass quick-change glazing hidden frame (tempered glass only).

(Alternative) Bonded or adhesive.

(Default/Standard) Laminated Glass - The front door panel glazing material shall have a nominal ¼ in. thick laminated safety glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

(Alternative) Tempered Glass - The front door panel glazing material shall have a nominal ¼ in. thick tempered glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

Requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

5.0 DOOR OPERATION

5.1 Door Actuator Power Options

(Default/Standard) Air-powered - The door system shall operate according to specification at air pressures between 90 and 130 psi.

(Alternative) Electric - The door system shall be electrically powered and shall operate per specification.

5.2 Transit Door Actuator Requirements

a) Actuators and the complex door mechanism shall be concealed from passengers but shall be easily accessible for servicing.

b) The door actuators shall be rebuildable / serviceable.

c) If powered by compressed air, exhaust from the door system shall be routed below the floor of the bus to prevent accumulation of any oil that may be present in the air system and to muffle sound.

d) Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

5.3 Commuter Coach Door Actuator Requirements

Actuators and the complete door mechanism shall be concealed from passengers but shall be easily accessible for servicing.

5.4 Transit Bus Door Geometry Types

Front Door

(Default/Standard) Slide Glide or Inward Glide

(Alternative) Swing Plug

(Alternative) Other

Rear Door

(Default/Standard) Slide Glide or Inward Glide

(Alternative) Swing

(Alternative) Swing Plug

(Alternative) Sliding Plug

Rear Doors that employ a “swing” or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver’s door control is moved to an “Exit Door Enable” position and the vehicle is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Rear Locked doors shall require a force of more than 300 pounds to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators, or complex mechanisms.

5.4 Commuter Coach Door Geometry Types

(Default/Standard) Swing

(Default/Standard) Swing Plug

(Alternative) Other

5.4 Transit Bus Door Open / Close Time Requirements

Doors shall open or close completely in not more than 3.5 seconds from the time of initial door movement and shall be subject to the closing force requirements.

Control algorithms shall ensure satisfaction of the above requirements while maintaining safe door operation. In cases where these requirements are mutually exclusive, the safety requirement must be prioritized.

5.5 Commuter Coach Door Open / Close Time Requirements

The nominal door opening and closing speed shall be in the 3-5 second range.

Pneumatically controlled door drivers opening and closing speeds will be regulated using fixed, maintenance-free orifices and airline sizes.

Electrically operated door system opening and closing speeds shall be adjusted through the door system electronic controller.

5.6 Emergency Operation

Sensors will be used to sense the closed position of each door panel. Open doors designated as emergency exits from inside the bus using a force of no more than 25 pounds after actuating an unlocking device.

The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate.

The respective door emergency unlocking device shall be accessible from the doorway area.

The unlocking device shall be easily reset by the driver without special tools or opening the door mechanism enclosure.

Doors that are required to be classified as “emergency exits” shall meet the requirements of FMVSS 217.

5.7 Door Forces and Obstruction Sensing

a) Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in. per second.

b) Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle.

c) If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

d) Power-close doors shall be equipped with an obstruction-sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction prior to imparting a 10 pounds force on one square inch of that obstruction.

e) Power-close front and rear doors shall be equipped with an obstruction-sensing system.

(Default/Standard) Pneumatic Sensing Edges

(Default/Standard) Electric Sensing Edges

(Alternatives) Contactless Sensing (Ultrasonic, Infrared, Vision, Capacitive etc.).

f) If a contactless obstruction sensing system is employed, then it shall be capable of discriminating between the normal doorway environment and passengers or other obstructions within the doorway, and of altering the zones of detection based upon the operating state of the door system.

g) Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors.

h) Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 pounds applied to the center edge of the forward door panel.

i) Whether or not the door obstruction-sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 pounds.

6.0 DOOR CONTROL

6.1 The door control shall be in the driver's area toward the street side of the driver's controls within the hand reach envelope described in SAE J287, "Driver Hand Control Reach." The driver's door control shall provide tactile feedback to indicate commanded door position and resist inadvertent door actuation.

6.2 Transit Bus Door Controller

(Default / Standard) Five-Position Driver's Door Controller

The control device shall be protected from moisture. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver. The door control device handle shall be free from interference by other equipment and have adequate clearance so as not to create a pinching hazard. Position of the door control handle shall result in the following operation of the front and rear doors:

Center Position: Front door closed, rear door(s) closed or set to lock.

First Position Forward: Front door open, rear door(s) closed or set to lock.

Second Position Forward: Front door open, rear door(s) open or set to open.

First Position Back: Front door closed, rear door(s) open or set to open.

Second Position Back: Front door open, rear door(s) open or set to open.

(Alternative) Two-position switch for front door only.

6.3 Transit Bus Door Control

Front Door

(Default/Standard) Operation of, and power to, the front passenger doors shall be completely controlled by the driver.

(Default/Standard) A control or valve in the driver's compartment shall shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down.

(Default/Standard) The front door shall remain in commanded state position even if power is removed or lost.

(Alternative) Define

Rear Doors

(Default/Standard) The rear door actuator(s) shall be under the complete control of the driver and shall open and close in response to the position of the driver's door control.

(Alternative) The rear doors shall be passenger controlled. The driver shall unlock and enable the opening mechanism, which shall be annunciated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by either the passenger manually pushing the door open, or by a powered mechanism actuated by passenger activation of a touch bar or touch switch, or by passenger activation of a contactless sensing system. A switch located within reach of the seated driver shall, when actuated, restore rear door function to complete driver control, and shall open and close in response to the position of the driver's door control.

(Default/Standard) A master door switch, which is not within reach of the seated driver, when set in the "off" position shall close the rear/center doors (if applicable), deactivate the door control system, release the interlocks and permit only manual operation of the rear/center doors.

(Alternative) An exterior door control switch shall be installed.

(Alternative) An air dump valve which will allow manual operation doors shall be accessible from the exterior of the bus.

6.4 In cases where street-side and curbside doors are chosen, provisions shall be made for operating the front door, curbside rear door(s) and street-side rear door(s) independently or in the combinations shown in Table 10 while providing positive tactile feedback to the driver identifying the door control selection.

6.5 Commuter Coach Door Control

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled.

TABLE 10: Door Operating Combinations

Front	Curbside Rear	Street-Side Rear
Closed	Closed	Closed
Open	Closed	Closed
Open	Open	Closed
Open	Closed	Open
Open	Open	Open
Closed	Open	Closed
Closed	Closed	Open
Closed	Open	Open

7.0 PASSENGER INTERLOCKS

7.1 In nonemergency operation, to prevent opening mid and rear passenger doors while the bus is in motion, a speed signal provided by the vehicle shall be integrated with the door controls to prevent the mid/rear doors from being enabled or opened unless the bus speed is less than 2 mph.

7.2 A positive brake application shall be required to engage or disengage the interlock system.

7.3 Doors shall not open until the bus is less than 2 mph and the brake interlock is engaged.

7.4 Once the vehicle has come to a full stop, to preclude movement of the bus, an accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus when the driver's door control is moved to a mid/rear door enable or open position, or a mid or rear door panel is opened more than 3 inches from the fully closed position (as measured at the leading edge of the door panel from the door closed position).

7.5 Sensors will be used to sense the closed position of each door panel.

7.6 The interlock engagement shall be capable of holding a fully loaded bus on a 6% grade until the interlocks are released; for diesel and CNG propulsion, this holding capability on a 6% grade may be met with the transmission in gear.

7.7 These interlock functions shall be active whenever the vehicle master run switch is in any run position (See Table 11).

(Default/Standard) Non-adjustable brake interlock regulator.

(Alternative) All door systems employing brake and accelerator interlocks shall be supplied with supporting failure mode effects analysis documentation, which demonstrates that failure modes are of a fail-safe type, thereby never allowing the possibility of release of interlock while an interlocked door is in an unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

(Alternative) No positive brake application shall be required to engage or to disengage the interlock system.

(Alternative) Braking effort of brake interlock regulator adjustable with hand tools to be configured and set to meet stopping and hill hold requirements.

(Alternative) No requirements for accelerator and brake interlocks whenever front doors are open.

(Alternative) Require Accelerator Interlock Whenever Front Doors Are Open - An accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus whenever front doors are open.

(Alternative) Require Positive Brake Activation - To prevent vehicle braking using only the door controls as vehicle speed drops below 2 mph, a positive brake application is required to engage accelerator and brake interlocks as the bus is coming to a full stop. To ensure that it is safe to move the bus from a full stop, a positive brake application by the driver is required to disengage the interlocks after doors close and lock.

Floor Layouts Standardization Working Group

Floor Layouts

Unique Floor Plans Impact Multiple Systems

- The floor plan design requires integration of HVAC locations, seating, grab bars, doors and windows.
- Specification delays and incomplete information create cascading timeline impacts across the supply chain
- Variations in internal structure mounting conditions require custom engineering solutions for each project
- There can be extended engineering cycles due to iterative clarification processes

Cost Reduction Opportunities

Benefits of standard floor plan templates:

- Faster layout engineering cycle times through first-time-right specifications
- Reduced engineering iterations and rework across all parties
- Improved lead times from specification receipt to delivery
- Lower overall project costs through elimination of change orders and corrections
- Enhanced collaboration between transit authorities, OEMs, and suppliers

TABLE 11: Passenger Door Interlocks

Brake Pedal	Vehicle Speed	Rear Door Controller Position	Brake/ Accelerator Interlocks	Service Brakes	Doors	Remarks
Normal Driving						
OFF	>2 mph	Closed	Off	Off	Closed	
ON	>2 mph	Closed	Off	Off	Closed	
OFF	<2 mph	Closed	Off	Off	Closed	
ON	<2 mph	Closed	Off	Off	Closed	
Accidental or Intentional Door Control Actuation						
OFF	>2 mph	Open	Off	Off	Closed	Driver accidentally places door controller in open position.
ON	>2 mph	Open	Off	Off	Closed	
OFF	<2 mph	Open	Off	Off	Closed	Bus coasts below 2 mph.
ON	<2 mph	Open	On	Off	Open	Interlocks turn on and doors start to open *after* brake application when speed is below 2 mph.
ON	<2 mph	Open	On	On	Open	Full stop. Doors fully open.
OFF	<2 mph	Open	On	On	Open	Driver releases brake pedal.
OFF	<2 mph	Close	On	On	Open	Driver commands door to close. Doors start to close.
OFF	<2 mph	Close	On	On	Closed	Doors fully closed and locked. Interlocks remain on. Brake application required to cancel.
ON	<2 mph	Close	Off	Off	Closed	Positive brake application cancels interlocks. Bus can now move.

30’ Bus / 23-Pass

Seat Models:

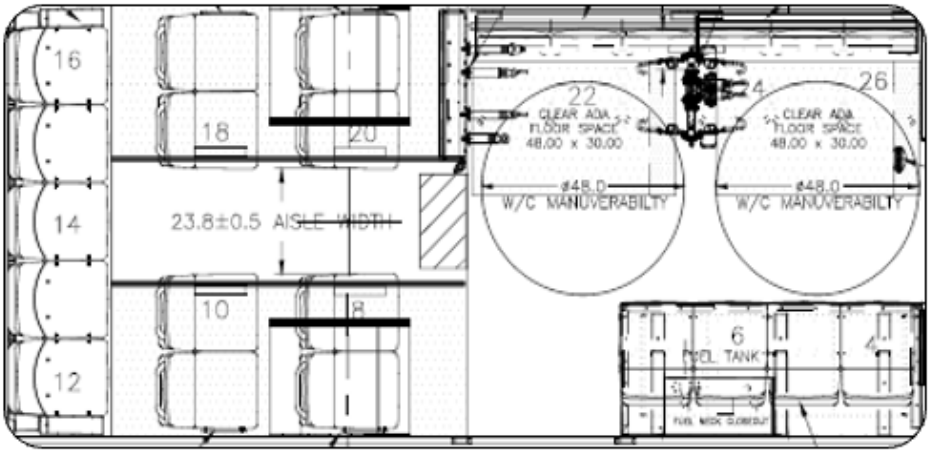
- Injection Molded Plastic shell, and grab handles where applicable in light grey, dark grey or blue
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable

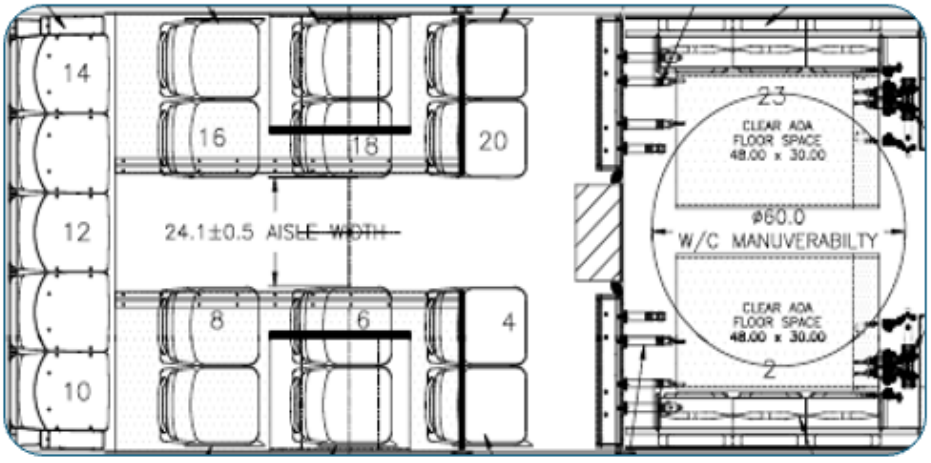
Inserts choices of plastic, vinyl or fabric

Docket-90A compliant – optional

ADA Section Choices:

- 3-point –
- 4-point –
- Automatic Wheelchair securement system





35’ Bus / 31-Pass / 33-Pass

Seat Models:

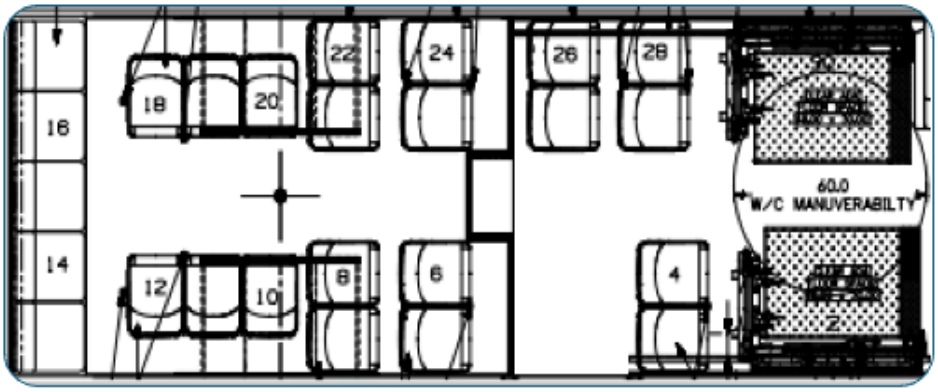
- Injection Molded Plastic shell, and grab handles where applicable in light grey, dark grey or blue
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable

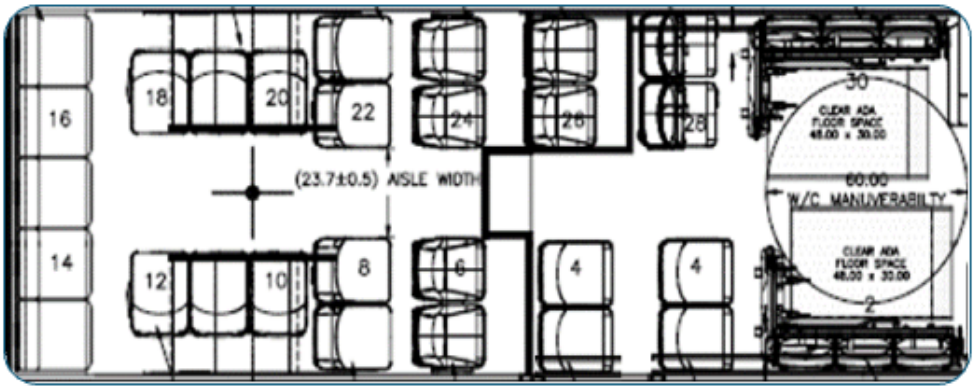
Inserts choices of plastic, vinyl or fabric

Docket-90A compliant – optional

ADA Section Choices:

- 3-point –
- 4-point –
- Automatic Wheelchair securement system





40’ Bus / 37-Pass / 38-Pass

Seat Models:

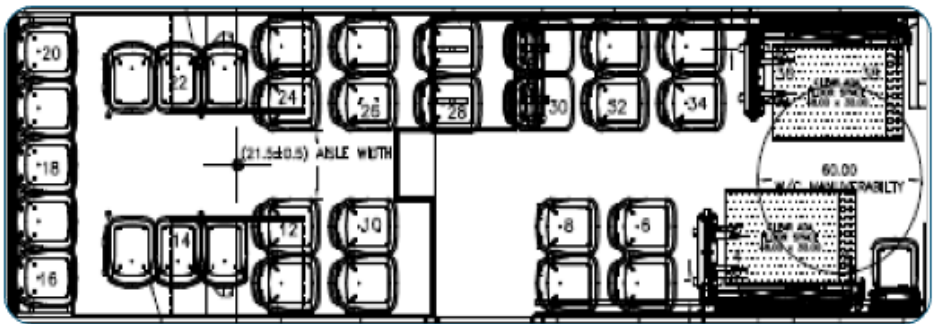
- Injection Molded Plastic shell, and grab handles where applicable in light grey, dark grey or blue
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable

Inserts choices of plastic, vinyl or fabric

Docket-90A compliant – optional

ADA Section Choices:

- 3-point –
- 4-point –
- Automatic Wheelchair securement system



40’ Bus / 40-Pass / 39-Pass

Seat Models:

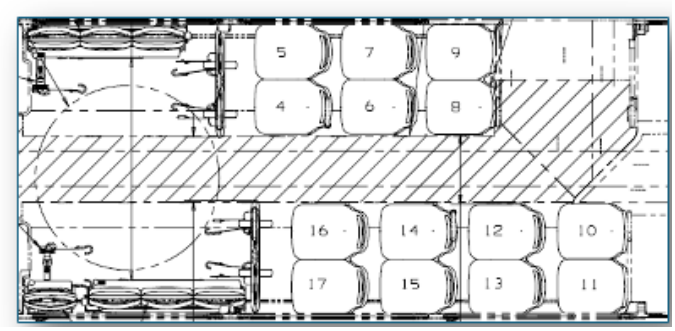
- Injection Molded Plastic shell, and grab handles where applicable in light grey, dark grey or blue
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable

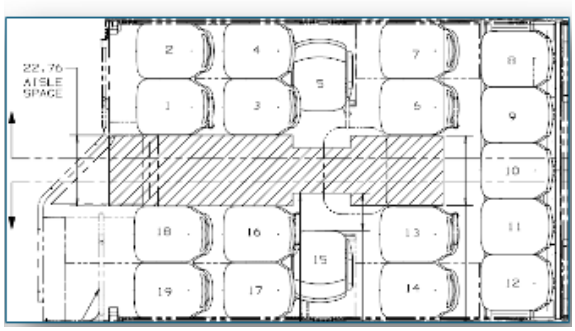
Inserts choices of plastic, vinyl or fabric

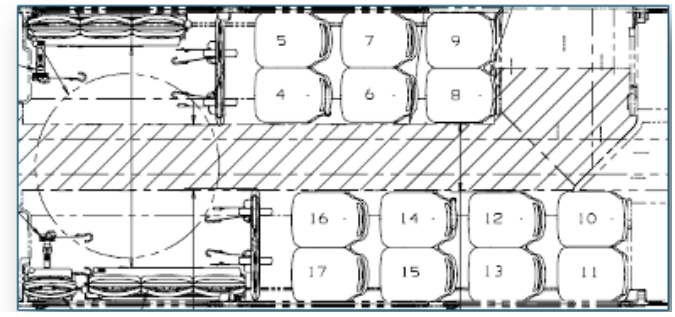
Docket-90A compliant – optional

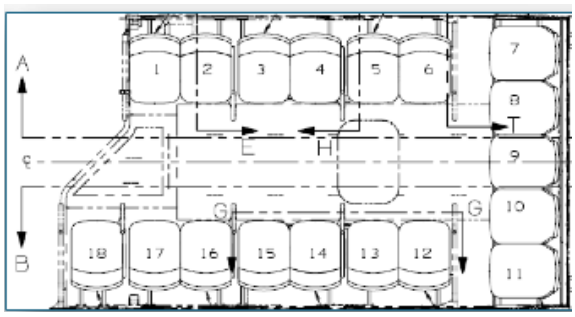
ADA Section Choices:

- 3-point –
- 4-point –
- Automatic Wheelchair securement system









60’ Bus / 52-Pass / 47-Pass

Seat Models:

- Injection Molded Plastic shell, and grab handles where applicable in light grey, dark grey or blue
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable
- Corrosion resistant frames, mountings, back panels, and grab handles where applicable

Inserts choices of plastic, vinyl or fabric

Docket-90A compliant – optional

ADA Section Choices:

- 3-point –
- 4-point –
- Automatic Wheelchair securement system