



## **Oversight Procedure 32A — Project Transit Capacity Review**

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### **1.0 PURPOSE**

This Oversight Procedure (OP) describes the review, analysis, recommended procedures, and reporting requirements that the Federal Transit Administration (FTA) expects from the Project Management Oversight Contractor (PMOC) regarding the transit design capacity, functionality, and project definition for critical project scope elements relative to those required to achieve forecasted conditions and be consistent with sound engineering practices.

While this OP focuses on Capital Investment Grant (CIG) projects, which have specific requirements by law, it also applies to all capital projects. FTA will issue Implementation Plans (IPs) to clarify the specific reviews and expected deliverables based on the project types.

### **2.0 BACKGROUND**

In the past, FTA projects have sometimes reduced the capacity to meet cost ceilings. This approach emphasizes near-term capital cost at the expense of long-term use of the infrastructure investment. Project expansions and renovations are expected on some of these projects within ten years of revenue operations. Undertaking a transit capacity review is one tool FTA can use to ensure more efficient use of public funds.

### **3.0 OBJECTIVES**

A transit capacity review may occur prior to a project's Entry into Engineering phase, and it may be conducted prior to awarding a Full Funding Grant Agreement (FFGA), if the project's scope or the project sponsor's operations have changed since the engineering phase review. However, it can be also ordered earlier if the scope of investment is known and FTA is concerned about core capacity impacts of the proposed investment.

The evaluation of transit design capacity is critical to FTA's determination as to whether the project:

- Can meet its stated project purposes and goals, and at least its 20-year forecasted ridership and level of service;
- Is "right-sized" or not too big or small;
- Employs economies of scale; and,
- Keeps operating, maintenance, and rebuild costs reasonably low over the long term.

In addition, if the project will become part of an existing transit system, the assessment will include the project's impact upon the capacity of the existing transit system. The review should be tailored to the specific project sponsor, their track record, and the risks associated with implementation of the proposed project.

If the project is proposed as a Core Capacity Improvement Project, the sponsor must demonstrate that the corridor is at or over capacity; or is projected to be at or over capacity within the next five years.

## 4.0 REFERENCES

The PMOC shall become familiar with the following references to Federal legislation, regulation, and guidance before reviewing the project sponsor's work. In addition, the statutes, regulations, policies, circulars, and guidance documents noted in OP 01 apply.

These are the principal references, but this list is not exhaustive:

### 4.1 Legislative

- [49 United States Code \(U.S.C.\) Chapter 53](#), Public Transportation

### 4.2 Reference Documents

- *TCRP Report 165: Transit Capacity and Quality of Service Manual*, 3rd edition (2013)

## 5.0 PROJECT SPONSOR SUBMITTALS

Information required to accomplish this review include all engineering studies, preliminary reports, drawings, and other documents produced on the project to date, which describe the project details. Specifically, the PMOC should review the following documents and information submitted by the project sponsor:

- Drawings of proposed transit project;
- Drawings of the existing transit system (civil, architectural, electrical, mechanical, communications);
- Operations plans;
- Fleet Management Plan;
- Capacity studies for the proposed project in the context of the existing system (as applicable);
  - The studies should cover applicable items in *TCRP Report 165* including but not limited to guideway and station sizing, including platform and support spaces for mechanical and electrical equipment and pedestrian circulation capacity and access for persons with disabilities (ADA);
- The project sponsor's previous experience with past capital projects that are related to the proposed project scope as reported in their grant application;
- Project sponsor staffing capacity and force account workload during the proposed project implementation period as reported in their grant application;
- Project sponsor's cost and schedule performance on past capital projects;
- Project sponsor's system, facilities, and equipment utilization before and after the introduction of the proposed project, as reported in their grant application;
- Project sponsor's plan for financing, staffing, and governing the proposed system improvement based on the project sponsor finance plan, as updated at each phase of the project;

- Project sponsor’s plans for interfaces with other systems and utilities based on the project sponsor’s finance plan, as updated at each phase of the project;
- Results of any prior “Before and After” studies; and
- Project sponsor’s baseline performance on ridership and operating efficiency metrics as reported in annual reports or to the National Transit Database (NTD) program including:
  - System and corridor ridership trends;
  - Peak of peak hour ridership at maximum load point in project corridor;
  - Peak hour vs. average daily use in project corridor;
  - Systemwide Fare Box Recovery Ratio (Fare Revenue/Operating Cost);
  - Vehicles spare ratio to peak hour needs as reported to NTD; and
  - Vehicles Mean Distance Between Failures as reported to NTD or annual reports.
  - For Core Capacity Improvement Projects documentation of the current and projected ridership in the corridor; current limitations to expansion of capacity in the corridor; and how the proposed improvement will increase transit capacity in the corridor by 10 percent or more.

## **6.0 SCOPE OF WORK**

The PMOC should review the project sponsor’s drawings, operations plans, and capacity analyses. Assess and evaluate the physical capacity of the project and its component parts to accommodate the forecasted ridership and level of service. Assess long-term vs. short-term capital, operating cost, and service trade-offs inherent in capacity choices.

If the project will become part of an existing transit system, assess the project’s impact upon the capacity of the existing transit system, for example, will the project boost the carrying capacity of the entire system, overload the system or create bottlenecks. Consider whether the project sponsor can build, operate, and maintain the entire system without reducing existing public transportation services or the level of service to operate the proposed project. Consider the project sponsor’s financial and staffing capabilities to operate and maintain the project in addition to their existing system.

Referring to *TCRP Report 165*, the PMOC shall identify the topics applicable to the project. The capacity sections of the manual provide both planning and detailed operations analysis procedures for assessing the capacity for transit modes and the individual components within transit projects. Employ the building-block approach suggested in the manual. Initially, address the capacity characteristics of individual transit stops and station components. Then expand the concepts to address the capacity of broader transit services, facilities, and systems.

The PMOC shall review the relevant items according to the current project phase as follows:

1. Reviews for Entry to Engineering
2. Reviews during engineering
3. Reviews for FFGA

The PMOC shall gain an understanding of the following with respect to the project and the project sponsor’s updates on the current project phase at the time of the PMOC review. For Core Capacity Improvement Projects, the PMOC shall also gain an understanding of the current or

projected limitations to expansion of transit capacity within the selected corridor and how the proposed improvements will increase transit capacity by 10 percent or more.

- Route information
  - Selection
  - Route and station coordination for ease of transferring among passenger transport agencies
  - Requests and requirements by customers, public officials, other departments, or the general public
  - Paratransit operations
- Schedule and staffing<sup>1</sup>
  - Headways
  - Schedule adherence
  - Operational constraints
    - During construction (access to construction, shut down of transit and utilities, etc.)
    - During full revenue service
    - Due to weather-related emergencies and other unexpected occurrences
    - Verify sufficiency of staffing
    - Verify sufficiency of funding for operations considering agency finances
- Station design<sup>2</sup>
  - Pedestrian access from public way; intermodalism or connectivity with other passenger transport;
  - Fire exit design criteria for public areas, platforms, stairways;
  - Capacity of escalators, elevators, stairs;
  - Dimensional and clearance requirements of the ADA.

The PMOC’s evaluation shall include:

1. “Line capacity” or theoretical capacity of the project, is defined by *TCRP Report 165* as “the maximum number of trains that can be operated over a section of track in a given period of time, typically one hour...The factor providing the lowest capacity—the weakest link—will constrain the capacity of a given section of a line.” As the report notes, “ideally, the combination of the train signaling system being used and the station with the longest dwell time will control the line capacity. However, under less-than-ideal conditions, any number of

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<sup>1</sup> Starting with Entry into Engineering, unless the scope of investment is known earlier. Re-reviewed for FFGA as indicated by changes in details of the system design or the project sponsor’s operations.

<sup>2</sup> Typically only reviewed for engineering phase and for FFGA when design or conditions are substantially changed from the engineering phase.

other factors may control line capacity.” The PMOC shall analyze other factors that may control line capacity including:

- a) Line capacity and vehicle capacity, both relating to the number of trains that can be operated per hour, are equivalent terms for rail.
  - b) Station dwell time and the minimum train separation produced by the signaling system.
  - c) Signaling systems designed for the minimum planned train headway, rather than maximum capacity.
  - d) Speed restrictions due to sharp curves or steep downgrades on the approach to the station with the longest dwell time;
  - e) Line crossings and merges, particularly at-grade track junctions;
  - f) Time required to turn back a train at a terminal station;
  - g) Mode-specific issues, such as light rail trains operating in mixed traffic or commuter rail trains sharing tracks with freight trains;
  - h) Traction power substation type and characteristics, DC distribution systems including the OCS, DC feeders, and return rails, and the power characteristics of the vehicles to be used on the system;
  - i) Person capacity after adjustments to line capacity;
  - j) Capacity modeling shall develop static and dynamic elements for traffic operations and other guideway elements such as vertical and horizontal curvature and line-of-sight restrictions;
  - k) Capacity of the project’s maintenance infrastructure (as-built) such as shops, yards, secondary maintenance, component rebuilds, or capital inventory requirements using a structured and methodical approach that makes maximum use of previous Transportation Research Board work and other existing engineering data.
2. Capacity of the transit project as required to meet the passenger load requirements forecasted for the revenue operations date (peak-hour passenger boardings) and the recommended “mature capacity” identified in *TCRP Report 165*. (When the transit project is forecasted to operate with crowding, consider how long the typical passenger will be expected to ride on a crowded vehicle and what fraction of the overall forecast ridership they will be riding under crowded conditions.);
- a) Consider capital costs, operating, maintenance, and replacement costs. (This assessment shall also address the relationship between cost and transit design capacity for the project and the system.)
  - b) Consider the forecasted ridership for the project in terms of milestones, including opening day of service, the 20-year forecast year, and system-specific milestones that may be noted in the fleet management plan.
  - c) Estimate the useful economic life for major project elements. Refer to the “Build Annualized Worksheet” within FTA’s Standard Cost Category The workbooks (New Starts SCC Workbook, Small Starts SCC Workbook, and Core Capacity SCC Workbook) are available on FTA’s public website for useful life lengths.

- d) Assess for cost effectiveness the proposed “build out” approach for the transit project given the revenue operations date and the 20-year, 50-year, and 100-year horizons (if specified in project plans). Recommendations should consider the time value of money at the prevailing public bond rate as well as the costs associated with various construction approaches where specified for possible future expansions.
  - e) Consider potential enhancements and benefits to the existing transit systems (transfer stations, intermodal connections, passenger comfort, and travel time savings)
  - f) Consider urban development enhancements and potential benefits to the communities.
3. Technological and organizational risks posed by the proposed project including:
- a) Is the proposed technology new or proven in the industry?
  - b) Is the proposed technology new or proven on the project sponsor’s system, and how does it fit with the existing system and support facilities including those for maintenance and storage?
  - c) Do relationships among stakeholders and funding partners seem durable and realistic?
  - d) Are interfaces with systems and utilities likely to succeed?
  - e) Does the track record of the project sponsor or design of the proposed project indicate possible risks relative to:
    - i) Failure to meet forecast growth in ridership after opening year
    - ii) Overcrowding or underutilization during peak periods
    - iii) Meeting fare revenue and operating cost forecasts
    - iv) Maintaining appropriate spare ratios (too low or too high)
    - v) Maintaining an acceptable level of in-service vehicle failures

## **7.0 REPORTS, PAPERS, PRESENTATIONS**

The PMOC shall provide the Contracting Officer’s Representative (COR) / Alternate Contracting Officer’s Representative (ACOR) with a written report, formatted in compliance with OP 01, of their findings, analyses, recommendations, professional opinions, and description of the review activities undertaken, as well as other supporting information.

After the COR/ACOR has transmitted formal acceptance of the report, the PMOC should share the report with the project sponsor. If there are differences of opinion between the PMOC and the project sponsor regarding the PMOC’s findings, the COR/ACOR may direct the PMOC to reconcile their findings with the project sponsor and provide the COR/ACOR with a report addendum covering the modifications agreed upon by the project sponsor and PMOC.

When directed by the COR/ACOR, the PMOC shall perform data analysis and develop data models that meet FTA requirements using Microsoft Office products, such as Excel and Word, and use FTA templates when provided.

Upon approval by the COR/ACOR, the PMOC may add other software as required, but they should provide the COR/ACOR with documentation and report data when complete.



**APPENDIX A: ACCEPTABLE QUALITY LEVEL**

	<b>Desired Outcome</b>	<b>Performance Requirement</b>	<b>Checklist</b>	<b>Acceptable Quality Level</b>	<b>Performance Measure</b>	<b>Monitoring Method</b>
1	The PMOC shall review and analyze project capacity.	<b>R1a.</b> The PMOC shall develop and document a process for review and analysis of project capacity at all phases of the project.	<input type="checkbox"/>	<b>Q1a.</b> Process exists and has been followed.	<b>M1a.</b> Evidence of a documented process.	<b>MM1a.</b> Periodic review by FTA or its agent.
		<b>R1b.</b> The PMOC shall use their process to analyze and make recommendations concerning Project Capacity at all phases of the project.	<input type="checkbox"/>	<b>Q1b.</b> Review must be complete, and the PMOC will provide internal verification that the process, as documented, has been followed.	<b>M1b.</b> Documented review and analysis of reporting requirements and project capacity review.	<b>MM1b.</b> Periodic review by FTA or its agent.
2	The PMOC shall review and evaluate the project sponsor's capacity analyses and other documentation, evaluate physical capacity, assess long-term and short-term capital choices and, where necessary, evaluate	<b>R2a.</b> The PMOC shall evaluate project sponsor's documentation for Route Information, Schedule and staffing for proposed operations and Station design.	<input type="checkbox"/>	<b>Q2b.</b> PMOC must give their professional opinion regarding the project sponsor's route, staffing, and station design.	<b>M2b.</b> Documented evidence of a thorough review of the project sponsor's route, staffing and station design documents, supported by a professional opinion.	<b>MM2b.</b> Periodic review by FTA or its agent.
		<b>R2b.</b> The PMOC shall fully assess and evaluate the project's transit	<input type="checkbox"/>	<b>Q2b.</b> Professional opinion must be given regarding the	<b>M2b.</b> Documented evidence of a thorough review of	<b>MM2b.</b> Periodic

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	<b>Desired Outcome</b>	<b>Performance Requirement</b>	<b>Checklist</b>	<b>Acceptable Quality Level</b>	<b>Performance Measure</b>	<b>Monitoring Method</b>
	the impact on existing transit facilities during the various phases of the project.	capacity and quality of service using the <i>TCRP Report 165</i> manual, beginning with an analysis of individual stops and stations, then expanding the analysis to address broader system issues.		project sponsor's transit capacity using <i>TCRP Report 165</i> manual.	project sponsor's Project transit capacity characteristics, supported by a professional opinion.	review by FTA or its agent.
		<b>R2c.</b> The PMOC shall evaluate and address the line capacity of project sponsor's project, capacity to meet forecasted loads, relationship between cost and design capacity, forecasted ridership, estimated useful economic life, cost effectiveness for time value of money, and construction approaches. They shall also make suitable recommendations.	<input type="checkbox"/>	<b>Q2c.</b> Professional opinion must be given regarding the critical elements of scope, cost, and capacity.	<b>M2c.</b> Documented evidence of an evaluation of line capacity, transit capacity, cost effectiveness and other matters together with recommendations, supported by a professional opinion.	<b>MM2c.</b> Periodic review by FTA or its agent.
3	The PMOC shall document their findings, professional opinions, and recommendations in a report to FTA.	<b>R3.</b> The PMOC shall present their findings, conclusions, and recommendations to FTA and, upon FTA approval, will reconcile those recommendations with the	<input type="checkbox"/>	<b>Q3.</b> Reports and presentations are professional, clear, concise, and well written. The findings and conclusions have been reconciled with	<b>M3.</b> Evidence of the PMOC's findings, conclusions, recommendations, and presentation.	<b>MM3b.</b> Periodic review by FTA or its agent.



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	<b>Desired Outcome</b>	<b>Performance Requirement</b>	<b>Checklist</b>	<b>Acceptable Quality Level</b>	<b>Performance Measure</b>	<b>Monitoring Method</b>
		project sponsor to the extent possible.		other PMOC reports and have been reconciled with project sponsor to the extent possible.		



**APPENDIX B: ACRONYMS**

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<b>Acronym</b>	<b>Term</b>
ACOR	Alternate Contracting Officer's Representative
ADA	The Americans with Disabilities Act
AGC	Associated General Contractors of America
ATC	Alternative Technical Concepts
AVS	Associate Value Specialist
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor and Statistics
BRF	Beta Range Factor
BY	Base Year
CATEX or CE or CX or Exclusion	Categorical Exclusion
CCIP	Contractor Controlled Insurance Program
CE	Categorical Exclusion
CER	Cost Estimating Relationship
CFR	Code of Federal Regulations
CIG	Capital Investment Grant
CLIN	Contract Line Item Number
CM	Construction Manager

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<b>Acronym</b>	<b>Term</b>
CM/GC	Construction Manager/General Contractor
CMAR	Construction Manager at Risk
COR	Contracting Officer's Representative
CPM	Critical Path Method
CPTED	Crime Prevention Through Environmental Design
CR	Constructability Review
CVS	Certified Value Specialists
DB	Design-Build
DBB	Design-Bid-Build
DBE	Disadvantaged Business Enterprise
DBF	Design-Build-Finance
DBFOM	Design-Build-Finance-Operate and Maintain
DBOM	Design-Build-Operate and Maintain
DEIS	Draft Environmental Impact Statement
DF	Designated Function
DHS	Department of Homeland Security
DTS	Department of Transportation Services
EA	Environmental Assessment
EIS	Environmental Impact Statement

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<b>Acronym</b>	<b>Term</b>
EMP	Emergency Management Plan
ENR	Engineering News-Record
EPCM	Engineering/Procurement/Construction Management
ESWA	Early Systems Work Agreement
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration
FLSSC	Fire/Life Safety and Security Committee
FONSI	Finding of No Significant Impact
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GAO	Government Accountability Office
GC	General Contractor
GC/CM	General Contractor/Construction Manager
GMP	Guaranteed Maximum Price
HAZMAT	Hazardous Materials
IP	Implementation Plan
LONP	Letter of No Prejudice

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Acronym	Term
LPA	Locally Preferred Alternative
MBE	Minority Business Enterprise
MCC	Management Capacity and Capability
MDBF	Mean Distance Between Failures
MPO	Metropolitan Planning Organization
NEPA	National Environmental Policy Act
NTE	Not-to-Exceed
NTP	Notice to Proceed
O&M	Operation and Maintenance
OCIP	Owner Controlled Insurance Program
ODCs	Other Direct Costs
OHA	Operational Hazard Analysis
OIG	Office of Inspector General
OMP	Operations and Management Plan
OP	Oversight Procedure
P3	Public Private Partnership
PCMG	Project and Construction Management Guidelines
PD	Project Development
PDM	Project Delivery Method

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Acronym	Term
PHA	Preliminary Hazard Analysis
PMO	Project Management Oversight
PMOC	Project Management Oversight Contractor
PMP	Project Management Plan
POP	Project Oversight Plan
PTASP	Public Transportation Agency Safety Plan
QA/QC	Quality Assurance/Quality Control
R&D	Research and Development
RAMP	Real Estate Acquisition Management Plan
RAP	Rail Activation Plan
RCMP	Risk and Contingency Management Plan
RET	Risk Evaluation Tool
RFI	Request for Information
RFP	Request for Proposal
RFQ	Request for Qualifications
ROD	Record of Decision
ROW	Right-of-Way
RSD	Revenue Service Date
S/DBE	Small/Disadvantaged Business Enterprises

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<b>Acronym</b>	<b>Term</b>
SABCE	Stripped and Adjusted Base Cost Estimate
SABS	Stripped and Adjusted Base Schedule
SAVE	Society of American Value Engineers
SCC	Standard Cost Category
SCIL	Safety Certifiable Items List
SGR	State of Good Repair
SIT	System Integration Testing
SITP	Systems Integration Test Plan
SOP	Standard Operating Procedure
SOW	Scope of Work
SSCVR	Safety Certification Verification Report
SSGA	Small Starts Grant Agreement
SSI	Sensitive Security Information
SSMP	Safety and Security Management Plan
STIP	Statewide Transportation Improvement Program
SYGA	Single Year Grant Agreement
TAR	Travel Authorization Request
TBM	Tunnel Boring Machine
TCC	FTA Office of the Chief Counsel

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Acronym	Term
TCRP	Transit Cooperative Research Program
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIGER	Transportation Investment Generating Economic Recovery
TIP	Transportation Improvement Program
TOD	Transit-Oriented Development
TPE	FTA Office of Planning and Environment
TPM	FTA Office of Program Management
TRB	Transportation Research Board
TSA	Transportation Security Administration
TVA	Threat and Vulnerability Assessment
URA	Uniform Relocation Assistance and Real Property Acquisition Act
U.S.C.	United States Code
VE	Value Engineering
VECP	Value Engineering Change Proposals
WBE	Women Business Enterprise
WBS	Work Breakdown Structure
YOE	Year of Expenditure