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**APPLICABILITY FOR
Design and Engineering Design Standards Documents**

Project teams shall refer to their executed project contracts for applicable document versions/revisions.



Approvals: <hr/> PSO Chief Engineer <hr/> Director of Technical Standards & Requirements	ENGINEERING DESIGN PROCEDURES	EP- 03 Rev: 5
	Design Development, Submittal, and Review	
	Original Issue Date: Current Revision Date:	9/5/07 7/31/24

1.0 PURPOSE

This procedure sets forth the responsibilities and methods for design submittal and design review processes to achieve quality design through the following objectives:

- Meet design development expectations for each design milestone.
- Ensure coordination of the design submittal and design review process between project consultants, third-party reviewers, and Sound Transit staff.
- Achieve successful integration and documentation of the design review, comment responses, and verification processes between all involved parties.
- Ensure requirements are verified and traceable.
- Ensure design is constructable.

2.0 APPLICABILITY

This EP-03 applies to any design development project totaling \$20 million or more.

3.0 SCOPE

This procedure defines the development and review process of Sound Transit project design documents from project initiation through design completion.

Projects with complex design elements may require additional procedures, including special aspects of the review process such as independent peer review.

4.0 REFERENCES

- American Society of Civil Engineers 38-02: Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data
- American Society of Civil Engineers 7: Minimum Design Loads for Associated Criteria for Buildings and Other Structures
- Customer Signage Design Manual

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- Design Criteria Manual (DCM)
- Design Technology Manual
- Engineering Design Procedures (EP)
- Equipment and Facilities Numbering Standard
- Interface Coordination and Integration Plan
- International Building Code
- Manual on Uniform Traffic Control Devices
- National Environmental Policy Act
- National Fire Protection Association 13: Standard for the Installation of Sprinkler Systems
- National Fire Protection Association 14: Standard for the Installation of Standpipe and Hose Systems
- National Fire Protection Association 130: Standard for Fixed Guideway Transit and Passenger Rail Systems
- Project Integration Implementation Plan (PIIP)
- Program Control Policies & Procedures (PCPP) 01: Work Breakdown Structure
- Program Control Policies & Procedures (PCPP) 02: Cost Estimating
- Program Control Policies & Procedures (PCPP) 03: Scheduling
- Request for Proposal Requirements
- Sound Transit Standard and Directive Drawings
- Sound Transit Requirements Manual
- Sound Transit Standard Specifications
- State Environmental Policy Act
- Station Experience Design Guidelines
- WSDOT Design Manual Division 300
- WSDOT Right-of-Way Acquisition Plan (RAP)
- WSDOT Structural Submittal Expectations Matrix

5.0 ACRONYMS

- ADCS: Asset Data Collection Sheet

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- AHJ: Authority Having Jurisdiction
- ATO: Asset Transition Office
- CDM: Corridor Design Manager
- DBPM: Design-Build Project Manager
- DCM: Design Criteria Manual
- FADCS: Facility Asset Data Collection Sheet
- GEC: General Engineering Consultants
- GC/CM: General Contractor / Construction Manager
- ICIP: Interface Control and Integration Plan
- IFB: Invitation For Bid
- IFC: Issued For Construction
- LADCS: Linear Asset Data Collection Sheet
- MEP: Mechanical Electrical Plumbing
- NTP: Notice to Proceed
- OPS: Operations
- PCPP: Program Control Policies and Procedures
- PE: Preliminary Engineering
- PM: Project Manager
- PMSS: Project Management Support Services
- POC: Proof of Concept
- PX: Passenger Experience
- RFD: Request For Deviation
- RFP: Request for Proposal
- SDM: Senior Design Manager
- SME: Subject Matter Expert
- TOD: Transit Oriented Development
- TSS: Transportation Safety and Security

6.0 DEFINITIONS

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- Consultant Design Manager: Design team single point of accountability who oversees the design development to achieve a quality design which meets requirements and standards.
- Project Design Manager: Single point of accountability who performs day-to-day coordination between Sound Transit and design team during design development. The assigned design manager could be either a Sound Transit staff or a GEC/DBPM/PMSS consultant staff. Sound Transit staff could be a systems corridor design manager, infrastructure senior design manager or a project manager on the project.
- Design Reviewer: Project personnel or stakeholders who provides comments to design milestone submittals. The term can be ST SMEs, consultant SMEs or an independent design review consultant.
- Design Consultant Comment Responder: Design consultant subject matter expert who responds to design review comments
- Independent Design Review Consultant: Consultant who performs peer review of design milestone submittals in discipline areas where Sound Transit subject matter experts are not available. The consultant must be independent of the design team such as DBPM, PMSS, etc.
- Basis of Design Report: A report developed by design consultants that documents the design assumptions and decisions during design development.
- Concept of Operations: A document that sets out the vision for the service and describes how the operation of the system will meet service delivery and quality goals.
- Environmental Review Process: The environmental review process occurs when a project is reviewed to determine its potential environmental impacts and whether it meets federal, state, and local environmental standards. This process may include preparing an environmental impact statement or other documentation consistent with the National Environmental Policy Act and State Environmental Policy Act.
- Over-the-shoulder reviews: OTS reviews represent informal opportunities to check in with Sound Transit and other stakeholders, between formal deliverable submittals to confirm that the planning and design, as it progresses, fulfills requirements and expectations relative to design criteria and scope.

7.0 RESPONSIBILITIES

7.1 CONSULTANT DESIGN MANAGER

Consultant design manager responsibilities include the following:

- Ensure package submittal is complete and compliant with contract requirements, applicable standards, and criteria.
- Ensure all Sound Transit and third-party design review comments are incorporated and documented in the next milestone submittal.
- The consultant design manager will work with the design consultant comment responder to assign, address, or incorporate disposition of design review comments.

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- Conduct and document comment resolution meetings for each Design Milestone submittal and issue meeting minutes with action items and responsibilities.
- Verify all action items from the comment resolution meeting are closed.
- Verify all revisions in response to comments are incorporated and checked in accordance with the project Quality Management Plan.
- Verify all intra-contract discipline-to-discipline interface checklists are satisfactorily completed.
- Verify discipline checklists are completed.
- Verify the requirements of the Link Interface Coordination and Integration Plan (ICIP) as agreed to within the Project Integration Implementation Plan (PIIP) are complete or submitted in support of the appropriate design milestone.
- Verify the Facility Asset Data Collection Sheet (FADCS) is complete.
- Verify the Linear Asset Data Collection Sheet (LADCS) is complete.
- The design-build design manager is responsible for the above tasks during design-build projects.

7.2 PROJECT DESIGN MANAGER

Project design manager responsibilities are included in the design manager service level agreement (contact PSO Engineering for copy of design manager service level agreement).

7.3 DESIGN REVIEWER

The design reviewer responsibilities are included in the subject matter expert service level agreement and in the following. The independent reviewer responsibilities may differ based on concurrence between the project and ST engineering.

- Verify compliance of design documents to contract requirements, including the DCM or the Sound Transit Requirements Manual.
- Verify conformance to Design Technology Manual and Design Technology Essential Requirements checklists.
- Verify conformance to contract, applicable standards and codes, consultant's scope of work, and the basis of design.
- Each reviewer must review for their area of expertise only except when performing interface reviews.
- Design reviewers must provide comments with factual basis.
- Design reviewers must make comments within scope of work.
- In the event the design reviewer needs to make an out-of-scope comment, inform the project design manager and provide impact analysis to determine further action.

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- Design reviewers must provide comments within the submittal review period.
- In the event the design reviewer is unable to respond within the review period, inform the project design manager to determine a plan of action.

7.4 DESIGN CONSULTANT COMMENT RESPONDER

The design consultant comment responder responsibilities include the following:

- Work on the assigned design review comments to accept and incorporate, propose modified acceptance or require a resolution meeting if comment cannot be resolved.
- Work with the consultant design manager to identify out of scope comments which will impact cost, schedule, and/or budget and review with project design manager for direction.

8.0 QUALITY RECORDS

Quality checks must be implemented throughout the design to ensure a standard of quality for projects. Contract plans, specifications, reports, and estimates must be reviewed for completeness relative to the project scope, adherence to applicable codes and standards, consistency and accuracy with design calculations, clarity and consistency across the drawing set, constructability, operability, and maintainability. Designs must be checked, corrected, and verified. Quality checks on the following from this engineering procedure will be documented as quality records:

- Discipline specific checklists per section 9.1..C
- Identification of design reviewers list per section 9.2.2
- Design submittal and intake form per section 9.2.1
- Comment dispositions per section 9.2.5
- Design submittal verification per section 9.3.1

Each design submittal must follow quality procedures as detailed in the ST Quality approved project-specific Quality Management Plan (QMP) inclusive of visible, traceable, and verifiable design quality checking procedures with resultant Check Prints for design submittal documents (e.g. drawings, specifications, calculations, technical reports, technical memos, etc.).

9.0 PROCEDURES

9.1 REQUIRED DESIGN SUBMITTALS

9.1.1 Design Milestones

This section provides a summary of the design submittal milestones and the milestone purpose. Design milestone packages are submitted for progressive design review on ST projects. Depending on the individual project and project type, design milestone submittals may become combined or presented differently.

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- Conceptual Engineering (5% - 10%) – Completed in support of the environmental review process, including the definition, comparison, and assessment of alternatives. This effort includes vetting of any fatal flaws, overall cost comparison, mitigation measures, and right of way needs that will result in the identification of the preferred alternative for recommendation to advance to preliminary engineering.
- Preliminary Engineering (30%) – Advanced design of the preferred alternative. The preliminary engineering submittal is used as the basis to refine project cost and implement any mitigation requirements identified as part of the environmental review process and identifying requirements of AHJs. Sound Transit obtains concurrence of project stakeholders and AHJs of the preliminary engineering for entering into final design or development of the RFP for design-build projects.
- Final Design (Post Award Submittal – project/engineering determines design development % for submittal) *Applies to design-build projects* – Identification of key technical and project elements for design development towards the 60% milestone. The purpose of this submittal is to promote coordination between design disciplines as well as early Sound Transit input. This submittal must be prepared following contract award with the purpose of incorporating any accepted alternative technical concepts and any contract conditions with the RFP requirements.
- Final Design (60%) – Design advanced for all project elements, with additional focus on cost drivers, constructability, and compliance with all criteria, guidelines, and standards, including AHJ requirements. Independent constructability review takes place.
- Final Design (90%) – *Applies to design-bid-build and general contractor/construction manager (GC/CM) projects.* Design is substantially complete and ready for final review and minor project refinements that do not impact scope, schedule, or budget. Independent constructability review takes place.
- Final Design (100%) - Design is complete and submitted for final review. For DBB and GC/CM projects, reviews are limited to confirming all comments have been addressed.
- Invitation For Bid (IFB) – *Applies to design-bid-build and general contractor/construction manager (GC/CM) projects.* Final milestone to confirm contract documents are bid-ready, signed, and sealed.
- Issued for Construction (IFC) – Contract documents are ready for construction, signed, and sealed.

If the design development and submittal review process cannot be followed as described in this document, refer to EP-10: Design Criteria and Standards for instructions on the EP variance process.

9.1.2 Concept of Operations

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The Concept of Operations identifies the operational needs of projects and its stakeholders and provides guidance for the development of the programmatic requirements and Proof of Concept (POC) design. It is developed concurrent with the initial Conceptual Engineering design and continues to develop alongside the design.

9.1.3 Project Development and Design Submittal Tools and Expectations

A. Submittal Intake Form

The submittal intake form provides a list of the required submittals that must be included in the design submittal package for each required milestone. The submittal intake form is found in Exhibit EP-03-03.

B. Project Development Matrices

Project Development Matrices specifies project development expectations at each required milestone. These matrices must be used by the project design manager and engineer of record to monitor the project progress against the Project Development Matrices prior to each design submittal. Project Development Matrices for the different project delivery methods are found in Exhibit EP-02-02A/B.

C. Discipline Specific Checklists

Discipline specific checklists outlines the level of content expectations for the drawing plan sets and required deliverables that must be included in the design submittal package for each required milestone. Discipline specific checklists are included in ST Controlled Documents: [EP-03 Appendix A - Individual Discipline Specific Checklists](#).

1. The discipline specific checklists must be completed by the discipline designer of record and checked for accuracy and completeness by the consultant design manager.
2. The design consultant must propose which discipline checklists are applicable to the project. Any changes to the checklist must come as a submittal.
3. The project design manager must review and accept the proposal in advance of the first design submittal.
4. Each item on the discipline specific checklist must have a response of Y, N, or N/A.
5. If a line item has a response of N or N/A, the design consultant must propose which items are not applicable to the project.
6. The project design manager must review and accept the proposal in advance of the design submittal.

9.2 DESIGN SUBMITTAL REVIEW PROCESS

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Exhibit EP-03-01 illustrates the Design Review Workflow process.

9.2.1 Design Submittal and Intake Form

Upon receipt of applicable discipline specific checklists, the project design manager will review each discipline specific checklist for accuracy and completeness. The project design manager will document the result of the discipline checklist review, independent cost estimate, and quality records by completing and signing the Submittal Intake Form. The project design manager must also check the design calculations for general components such as objectives, inputs, assumptions, actual calculations, conclusion (summary), and attachments. All calculation sheets must be numbered and dated. The originator, checker, back-checker, corrector and verifier/reviewer of the calculation must be noted.

Any submittal that does not pass will be returned to the design consultant or design builder and will require a design package resubmission.

9.2.2 Identification of Design Reviewers

The project design manager must compile a list of all design reviewers and their discipline of expertise. The project design manager must assign a single point of contact reviewer for each discipline expertise for all project scope. This list must be kept current. The list of design reviewers must include agency subject matter experts for all project scope elements within the seven Core System disciplines, as listed below:

Core System Disciplines

1. Train Control and Signals
2. Traction Electrification
3. Operational Communications
4. Vehicle
5. Track
6. MEP/Fire-Life Safety
7. Structures/Geotech

Other reviewers may be included as necessary such as architecture, quality, PX, OPS, TSS, and ATO.

The project design manager must also compile the list of outside independent consultants (peer reviewers) and third-party reviewers for permitting purposes such as local, regional and state agencies, and public and private utility companies, collectively referred to as Authorities Having Jurisdiction (AHJ) who will serve as design reviewers for each project.

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Design reviewers must be identified by the project design manager and notified by email that a review will occur three weeks prior to the start of the review.

9.2.3 Design Deliverable Checks

- A. The project design manager must lead detailed checks for each design deliverable. Initial detailed checks must be checked as appropriate to the level of designs. Subsequent deliverables must be rechecked as all supporting data is accumulated. Responsibilities for the detailed checks are listed in the responsibilities.
- B. The consultant design manager must verify all defined pieces of data in the Facility Asset Data Collection Sheet (FADCS), Linear Asset Data Collection Sheet (LADCS), Warranty log, Spare Parts log, and Capital Spare Transfer log are complete. Sound Transit will provide these logs at Notice-to-Proceed.
 - 1. The level of content of each data collection log at each design milestone must be completed as described in the project development matrix and included with the design submittal.
- C. Criteria deviations and previous design review comments must be reviewed for relevance and incorporation during the checking process. The Request for Deviation (RFD) process must be followed. All criteria or code deviations must follow EP-10 and the approved process prior to inclusion in a design submittal.

9.2.4 Distribution of Design Milestone Documents for Review

The independent design reviews will be conducted through Bluebeam sessions and performed by the identified reviewers in section 9.2.2 herein. The review period will be open for fifteen (15) business days, after which the Bluebeam session will be closed. The Design Consultant / Design-Builder will not have access to the Bluebeam Session during this period.

The project three-week look-ahead and the monthly schedule updates must indicate the expected design milestone submittals and must include all project delivery methods.

9.2.5 Validation, Disposition, Response, and Verification for Design Review Comments

Following the closure of the Bluebeam session, the project design manager will have a five business day period to validate all comments and resolve any conflicting or incomplete comments. After comment validation, the Bluebeam session is opened to the design consultant / design-builder for the comment resolution period. Comment and response disposition legends are as follows:

- A. Design Consultant / Design-Builder Comment Disposition Legend:
 - Accepted

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The “Accepted” disposition indicates design consultant / design-builder acceptance of the comment as-is.

- Accepted as Modified

The “Accepted as Modified” disposition indicates acceptance of the comment in a form different than it was received. The modification shall be clearly stated.

- No Change Required/Out of Scope

The “No Change Required/Out of Scope” disposition indicates the comment does not require changes to the design document or the comment is out of scope and will be reviewed with the project design manager for direction.

- Requires Resolution Meeting

The “Requires Resolution Meeting” disposition indicates that the comment cannot be resolved and will be addressed at the comment resolution meeting.

B. Design Reviewer Response Disposition Legend:

- Accepted

The “Accepted” disposition indicates the design reviewer acceptance of the design consultant / design-builder’s comment disposition. The design consultant / design-builder must incorporate the comment in its entirety in the next milestone submittal.

- Not Accepted

The “Not Accepted” disposition indicates design reviewer has not accepted the design consultant / design-builder’s comment disposition. Comments with this disposition will be addressed at the comment resolution meeting.

C. Design Reviewer Verification Disposition Legend (Applies to Basis of Design Submittal for design-build projects):

- Accepted

The “Accepted” disposition indicates the design reviewer has verified the incorporation of the comment response into the design-builder’s verification documents. The design-builder may proceed to the next milestone submittal.

- Not Accepted (Resubmit)

The “Not Accepted” disposition indicates the comment has not been incorporated into the design-builder’s verification documents. The design-builder must resubmit the verification documents.

D. Sound Transit IFB/IFC Disposition Legend:

- Accepted (Approved for Bid or Construction)

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The “Accepted” disposition indicates the IFB or IFC is accepted for bid construction.

- Not Accepted (Resubmit)

The “Not Accepted” disposition indicates the IFB or IFC must be resubmitted to the project design manager for approval.

9.2.6 Comment Resolution Meeting

The Consultant Design Manager must conduct a comment resolution meeting with the ST DM, designer reviewers, and members of the design consultant team. Decisions on comment resolutions must be logged into the Bluebeam session. Meeting minutes, along with action items and due dates for action completion must be documented and distributed by the design consultant project manager to the project design manager. Sound Transit may direct that the comment resolution meeting also include representatives from third-party reviewers.

9.2.7 Over-the-Shoulder (OTS) Reviews

Over-the shoulder reviews may be optionally performed during design development. If projects choose to perform OTS reviews, the following criteria must be met.

- Over-the-shoulder reviews are performed collectively by the design consultant, Sound Transit consultant representatives, Sound Transit, and/or third-party representatives.
- Sound Transit participants for the over-the-shoulder review meetings must include engineering subject matter experts on the project and applicable Sound Transit staff.
- The Decision Log/Matrix must be developed and maintained as part of each over-the-shoulder review. Agreed upon decisions must be reflected in the next interim progress submittal review.
- Over-the-shoulder reviews must address progress of all design elements incorporated into the Work.
- For Design-Build projects:
 - a. Over-the-shoulder reviews are performed collectively by the contractor, DBPM, PMSS, and Sound Transit.
 - b. The contractor must provide the participation of their applicable design professional, subcontractors, design manager, and construction manager.
 - c. The contractor provides interim submittals for over-the-shoulder reviews based on design package or discipline.
 - d. Interim submittals reviews may be in addition to, or combined with, other related meetings, at Sound Transit’s discretion.

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9.2.8 Archiving Design Milestone Review Documents

Each Bluebeam session must be exported and saved as part of the project files.

9.3 REQUIREMENTS TRACEABILITY & VERIFICATION

9.3.1 Design Submittal Verification

The project design manager must provide verification of requirements conformance as referenced in NTD DD-1021 Requirements Management. *(The content of this NTD will be included in an upcoming new EP-16).*

9.4 PERMITTING

For permitting expectations at each required milestone, see Permits in Exhibit 03-03-02A/B Project Development Matrix.

9.5 ENVIRONMENTAL REVIEW

For environmental review expectations, see Environmental Review, Permitting, and Documentation in Exhibit 03-03-02A/B Project Development Matrix.

10.0 EXHIBITS

- EP-03-01: Design Review Workflow
- EP-03-02-A: Design-Bid-Build/GC/CM Project Development Matrix
- EP-03-02-B: Design-Bid Project Development Matrix
- EP-03-03: Submittal Intake Form

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EP-03-01 DESIGN SUBMITTAL REVIEW WORKFLOW

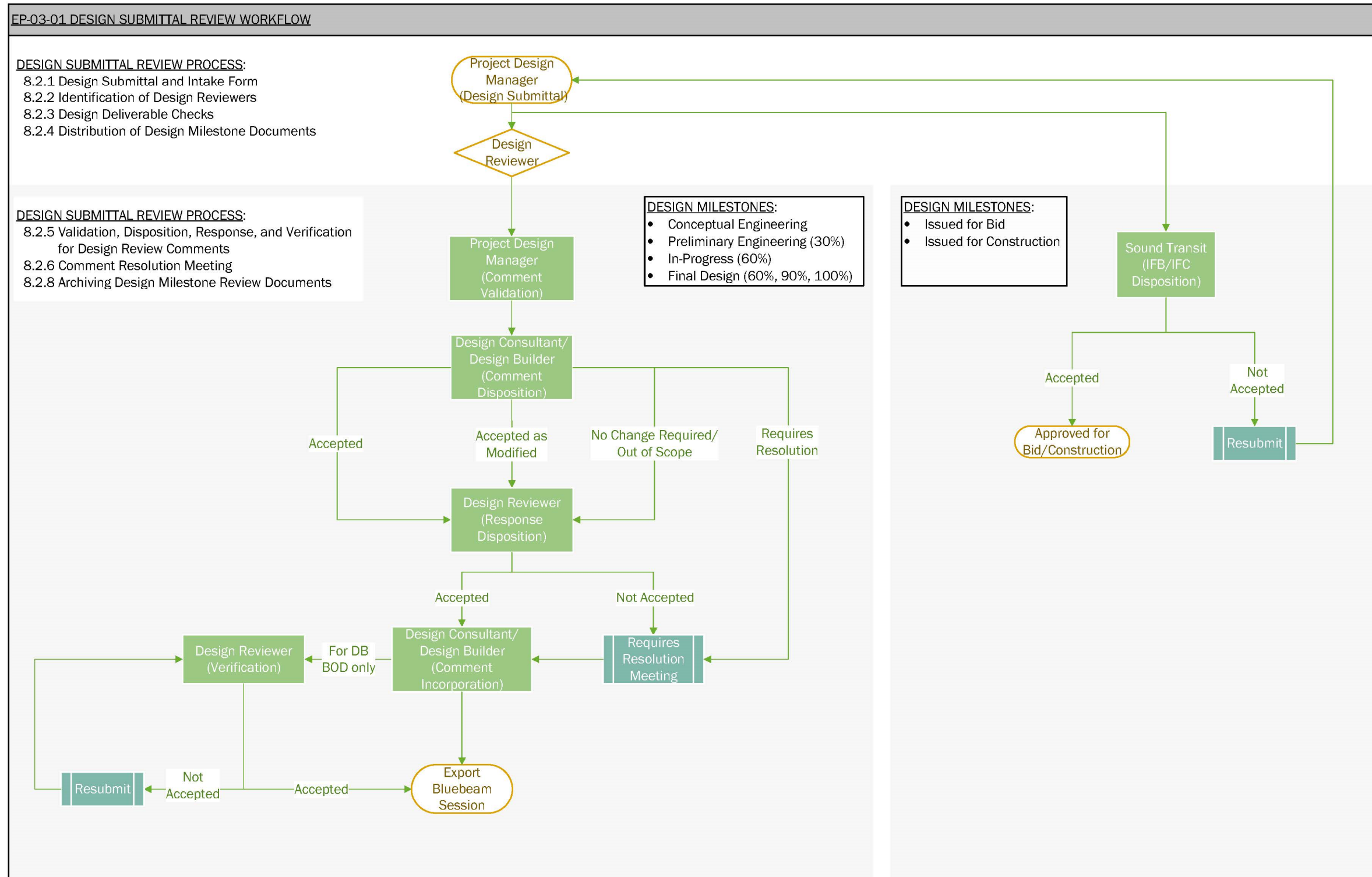


Exhibit EP-03-02-A Design-Bid-Build Project Development Matrix

Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
<p>Decisions Frozen and Milestones Completed (Overview)</p>	<ul style="list-style-type: none"> ✓ Roll plot level design defining footprint for each alternative ✓ Potential environmental impacts for each alternative ✓ Approval to advance to CE ✓ Concept of Operations drafted 	<ul style="list-style-type: none"> ✓ Completion of alternative analyses/ studies ✓ Draft environmental documentation ✓ Identify critical items that have significant schedule and cost estimate impacts which take further design than CE to resolve ✓ The Preliminary Hazard Assessment (PHA) and Threat and Vulnerability Assessment (TVA) workshops begin with aim to identify safety or security fatal flaws in the initial designs Identify Right-of-way (ROW) takes for all alternatives ✓ Identify transit time for each alternative ✓ Identify station type for each location based on the Station Experience Design Guidelines (SEDG) ✓ Identify bridge types for each location ✓ Identify operation access points along the guideway ✓ Third- party design mitigation plans finalized 	<ul style="list-style-type: none"> ✓ Single preferred alternative approved by the Board ✓ Final environmental documentation and commitment list ✓ Baseline cost estimate and schedule ✓ Contract type selected ✓ Approval to advance to Final Design ✓ Right-of-way (ROW) opinion of probable cost ✓ Value Engineering (VE) workshops completed and ideas list being reviewed ✓ Utilities identified and connection locations identified ✓ Letter of concurrences identified for all impacted Authorities Having Jurisdictions (AHJs) ✓ Special track work identified ✓ Draft Requirements Management Plan ✓ Draft Interface Coordination and Integration Plan (ICIP) ✓ Identify design packaging plan ✓ Concept of Operations finalized 	<ul style="list-style-type: none"> ✓ Request for Deviations (RFDs) identified and submitted ✓ Specification Modification Requests (SMRs) identified and submitted ✓ Accepted Interface Coordination and Integration Plan (ICIP) ✓ Approved Requirements Management Plan 	<ul style="list-style-type: none"> ✓ Detailed review of contract documents including IFB Bid Form to eliminate errors, conflicts, and omissions ✓ 3rd party independent reviews for drawing coordination and constructability secured ✓ Approved Request for Deviations (RFDs) ✓ Approved Specification Modification Request (SMRs) ✓ Accepted Value Engineering (VE) ideas incorporated into design 	<ul style="list-style-type: none"> ✓ 3rd party review results incorporated into submittal ✓ Right-of-way (ROW) takes finalized 	<ul style="list-style-type: none"> ✓ Plans and Specifications stamped and sealed ✓ Requirements management database approved
<p>Environmental Review, Permitting, and Documentation</p>	<ul style="list-style-type: none"> • Determine environmental impacts. • Agency and public coordination conducted • Identify authorities having jurisdiction 	<ul style="list-style-type: none"> • Update environmental impacts. • Public Coordination conducted • Identify sustainability goals • Prior to 30% submittal - Meet with the Cascade Water alliance to review irrigation and water conservation strategies and incentives for the project. Incorporate recommendations into 30% submittal 	<ul style="list-style-type: none"> • Final NEPA/SEPA Environmental commitment list • Update sustainability checklist • Detailed Code Study for each discipline • Phase 1 HAZMAT • Phase 1 Archeology • Provide a written summary of all the sustainability goals proposed for the project. • Provide calculations, illustrations and/or other documentation to communicate projected performance. • Provide LEED scorecard and LEED Management Plan • Register Project with USGBC. 	<ul style="list-style-type: none"> • All environmental commitments identified in the contract documents • Update sustainability checklist and generate report • Draft Environmental commitments matrix • 60% design plans for environmental mitigation elements as provided in Record of Decision • 60% design plans for sustainability and low impact development • 60% Design plans for wetland and sensitive areas 	<ul style="list-style-type: none"> • All environmental commitments and sustainability measures identified in the contract documents • Update Environmental commitments matrix • Final design plans for environmental mitigation elements as provided in Record of Decision • Final design plans for sustainability and low impact development • Final design plans for wetland and sensitive areas • Phase II HAZMAT 	<ul style="list-style-type: none"> • Environmental Commitments Matrix complete • Provide a written project sustainability report summarizing strategies addressing facility design, construction and operation. • Include goals and plan to track and document construction related items identified in the Sound Transit Sustainability Checklist. (whole project area) • Provide updated LEED scorecard and LEED Management Plan including documentation for Preliminary design review by GBCI 	<ul style="list-style-type: none"> • Coordinate with EAS on selection of an environmental compliance oversight consultant to be included • Coordinate with EAS on review of the RFP and/or RFQ for the construction management team • Submit Design Credits to GBCI for Review

Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
			<ul style="list-style-type: none"> • Provide final Report from team eco-charrette • Submit initial energy modeling results • Identify and evaluate possible paths to improvement for possible inclusion into the project 	<ul style="list-style-type: none"> • Code compliance diagrams and fish passage structures complete and incorporated into plan set • Provide updated LEED/ENVISION scorecard, credit by credit strategy and progress summary and LEED/ENVISION Management Plan • Provide initial Energy Analysis Report of the building(s). • Establish the energy budget for the building(s). • Provide project specific analysis. • Identify dominant loads, usage patterns etc. • Identify next level of possible energy efficient performance and provide cost benefit analysis for ST consideration. • Establish projected water usage. • Provide detailed breakdown of annual/monthly usage assumptions. • Separate building potable and irrigation uses. • Provide Draft Measurement & Verification (M&V) and Cx Plans if pursuing LEED credits. 	<ul style="list-style-type: none"> • Phase II Archeology 	<ul style="list-style-type: none"> • Finalize Energy Analysis Report and projected annual monthly energy use budgets. Align budget categories with sub metering strategy. • Finalize water budget and document water use reduction strategies. Provide estimated potable water usage reduction. • Finalize M&V Plan 	
Basis of Design			<ul style="list-style-type: none"> • Prepare BOD report to accompany the drawings and submittals in support of the 30% design. • Provide an understanding of the design assumptions and include references to technical decisions made during the course of the Work. • Document fundamental design assumptions, criteria, issues encountered, design solutions considered, and design recommendations. 	<ul style="list-style-type: none"> • Submit Updated BOD report • BOD must be accepted by ST Engineering and concurrence obtained from AHJs 	<ul style="list-style-type: none"> • Submit Updated BOD 	<ul style="list-style-type: none"> • Submit Final BOD 	

Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
Permits		<ul style="list-style-type: none"> Identify authority having jurisdictions Identify applicable codes and standards 	<ul style="list-style-type: none"> Prepare draft list of required permits 30% design meets dimensional standards or code variances identified AHJ coordination (including permit pre-applications and/or project meetings) 	<ul style="list-style-type: none"> Energy Code Compliance complete and integrated into design Identify all permits required; establish submittal schedule Completed permit applications & supporting documents per AHJ land use code requirements/ permit checklists Land Use Code compliance complete and integrated into design, including elements not specified in EP-03 60% design drawing checklists AHJ coordination (including permit pre-applications and/or project meetings) 	<ul style="list-style-type: none"> List of permits to be obtained by Contractor Implement permit conditions into 90% design 	<ul style="list-style-type: none"> Implement permit conditions into 100% design 	<ul style="list-style-type: none"> Compile issued permits
Estimates (ICE)	<ul style="list-style-type: none"> Update project budget through the PE phase Preliminary estimation of ROW cost 	<ul style="list-style-type: none"> Develop cost estimates for each alternative 	<ul style="list-style-type: none"> 30% estimate with allowance for identified geotechnical risks Opinion of ROW cost 	<ul style="list-style-type: none"> Construction and ROW cost updated Baseline estimate Account for cost impacts associated with specifications (special provisions) 	<ul style="list-style-type: none"> Finalize construction cost estimate Update ROW costs based upon purchases 	<ul style="list-style-type: none"> Final cost estimate Sign estimate 	<ul style="list-style-type: none"> Verify that low bid is acceptable when compared to ICE
Asset Data Collection: Facilities		<ul style="list-style-type: none"> Sound Transit Facility Asset Data Collection Sheet (FADCS) formatted for project. Individual ADCS documents are required for: Stations & associated structures, Parking Garages & associated structures, Pedestrian Bridges & associated structures, Operations & Maintenance Facilities & associated structures, Maintenance of Way structures & associated structures, Administration structures & associated structures, Park & Rides & associated structures, and Independent Ancillary Structures and Site Improvements not associated with any of the facility types listed above. 	<ul style="list-style-type: none"> Complete Tab-Z and adjust ADCS format as necessary to accommodate the to be constructed facility. 	<ul style="list-style-type: none"> On combined Tab A-Substructure B-Shell, and C-Interiors, and Tabs D-Conveying, E-Plumbing, F-HVAC, G-Fire Protection, H-Electrical, I-Equipment, and J-Site commence provision of data in assigned cells. For designated projects H.1-Electrical commence provision of data in assigned cells. Develop preliminary Door Schedule in format provided or agreed. Develop preliminary Interior Finish Schedule in format provided or agreed. 		<ul style="list-style-type: none"> Complete provision of data in assigned cells. Complete Door Schedule. Complete Interior Finish Schedule. 	

ENGINEERING DESIGN PROCEDURES EP-03 Design Development, Submittal, and Review	Issued: 9/5/07 Rev. 5 Date: 7/31/24
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Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
Asset Data Collection: Linear		<ul style="list-style-type: none"> Sound Transit Linear Asset Data Collection Spreadsheet (LADCS) formatted for project. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Commence provision of data in the tabs provided; Track/Bridge/Tunnel, OCS, Signal, TPSS, SCADA, Communication. 		<ul style="list-style-type: none"> Complete provision of data in assigned cells. 	
Spare Parts				<ul style="list-style-type: none"> Identify Spare parts needed in a draft spare parts list Get ST Operations review and feedback on the draft spare parts list 		<ul style="list-style-type: none"> Address comments and finalize spare parts list. 	
Warranty				<ul style="list-style-type: none"> Identify specific product warranties required in a draft list of warranties Get ST Operations review and feedback on the draft warranty list 		<ul style="list-style-type: none"> Address comments and finalize product warranties list. 	
Right-of-Way (ROW)	<ul style="list-style-type: none"> Right-of-entry (ROE) request for environmental investigations, and ALTA survey for protective and early acquisitions of full acquisitions. Basic high-level ROW requirements should be identified for each alternative and only permanent rights should be identified as full acquisitions Identify protective and early acquisitions for full acquisitions Order and review title reports for protective and early acquisitions, and request for ALTA surveys and have ALTA surveys completed and unsigned at appraisal kickoff Sound Transit ROW Engineer to assign ROW No. 	<ul style="list-style-type: none"> Right of Entry (ROE) request for discovery activities and advance design. Develop work plans for invasive ROE requests. Refine the full acquisition for ROW requirements which include station sites, staging areas, and parking garage sites. Order and review title reports for protective and early acquisition of full acquisitions, and request for ALTA surveys and have ALTA surveys completed and unsigned In-progress ROW base mapping from GIS and record information and ROW strip maps at 1" = 200' Civil Certify the full acquisitions which include certification deliverable schedule, parcel by parcel reviews, Civil Certification letter, parcel list, ROW plans, Letter of Concurrences and ROW Title Report Review Memos completed 	<ul style="list-style-type: none"> See ROW 30% Checklist 	<ul style="list-style-type: none"> See ROW 60% Checklist 	<ul style="list-style-type: none"> Sound Transit ROW Engineer shall be informed of any design/agreement changes impacting the acquisition footprint. The result of this will impact the acquisition schedule Design support for property acquisitions, condemnations, trials. Prepare ROW closeout scope 	<ul style="list-style-type: none"> Sound Transit ROW Engineer shall be informed of any design/agreement changes impacting the acquisition footprint. The result of this will impact the acquisition schedule Design support for property acquisitions, condemnations, and trials Finalize ROW closeout scope 	<ul style="list-style-type: none"> Sound Transit ROW Engineer shall be informed of any design/agreement changes impacting the acquisition footprint. The result of this will impact the acquisition schedule All property rights in hand 30 calendar days prior to ad Support ROW closeout

Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
Survey, Mapping, and Subsurface Utility Engineering	<ul style="list-style-type: none"> Obtain existing GIS grade or better surveys and basemaps to utilize during CE Notate survey control details and source documents (meta data) with reports and drawing plan sets Utilities collection and characterization designated by quality levels per ASCE 38-02 Survey methodology technical memo 	<ul style="list-style-type: none"> Project survey requirements identified, and area of impact identified for each alternative Project survey/mapping Local Datum Plane (LDP) identified or established. (Ground Coordinate System) Survey Horizontal and Vertical Control sheets developed Additional utilities data collection and characterization designated by quality levels per ASCE 38-02 	<ul style="list-style-type: none"> Translate survey and mapping efforts completed in CE to Established LPD Early in PE effort if this was not completed already by the end of CE Design level existing conditions topographic and cadastral survey complete for preferred alternative, including above ground and underground utilities Update Survey Control Plan as necessary. Horizontal and Vertical Control plans updated. Additional utilities data collection and characterization designated by quality levels per ASCE 38-02 	<ul style="list-style-type: none"> Update Design level existing conditions topographic and cadastral survey with new facilities, land development changes, or improvements to date Perform Survey support for Right of Way documents and deliverables included but not limited to Record of Surveys, ALTA, parcel maps, legal descriptions and sketches. Additional utilities data collection and characterization designated by quality levels per ASCE 38-02 Initiate power agreements 	<ul style="list-style-type: none"> Obtain applicable permits from AHJ, (e.g.: DNR, WSDOT, County, City, etc.), for destroying and resetting monuments, as needed. Horizontal and Vertical Control plans updated, if necessary, to show additional found or set monumentation Additional utilities data collection and characterization designated by quality levels per ASCE 38-02 	<ul style="list-style-type: none"> Preliminary construction staking data completed Finalize power agreements 	
Geotechnical	<ul style="list-style-type: none"> Scoping level Geotechnical Memo complete. Regional geology reviewed and risk areas input into alignment alternative study. Identify probable types of guideway foundations and track support with recommendation for most likely type to be considered. Foundation type and layout for identified special structures and facilities. Develop recommendations for future work to support CE. Identify specific areas for further investigation. Right of entry requests and Permitting for geotechnical investigations in CE Phase. 	<ul style="list-style-type: none"> Conceptual Level Geotechnical Reports/Memos submitted. Geologic hazards identified and impact to project assessed for all alternatives. Historical and existing Geotechnical data collected and evaluated for all alternatives. Field Explorations necessary completed to inform risk assessment and cost estimate for geologic hazard, high-risk subsurface conditions, and high-risk or unusual structures or facilities that have the potential to impact preferred selection. Explorations in support of the DEIS completed and results incorporated into DEIS. Identify geotechnical high-level risks and potential mitigation strategies for guideway foundations, track support and station facilities. Develop recommendations for future work to support PE. 	<ul style="list-style-type: none"> See Geotechnical 30% Checklist 	<ul style="list-style-type: none"> See Geotechnical 60% Checklist 	<ul style="list-style-type: none"> See Geotechnical 90% Checklist 	<ul style="list-style-type: none"> See Geotechnical 100% Checklist 	

Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
		<ul style="list-style-type: none"> Right of entry requests and Permitting for geotechnical investigations in PE Phase. 					
Structures	<ul style="list-style-type: none"> Guideway type study report identifying the probable types of elevated guideway superstructure and substructure types with recommendations for the most likely types to be considered. Structural layouts for identified special structure areas. 	<ul style="list-style-type: none"> Identification of all existing structures affected by all alternatives. Identification of impacts to existing structures requiring upgrades. Identification of locations, lengths, widths, and height of new structures for each alternative. 	<ul style="list-style-type: none"> See Structural 30% Checklist 	<ul style="list-style-type: none"> See Structural 60% Checklist 	<ul style="list-style-type: none"> See Structural 90% Checklist 	<ul style="list-style-type: none"> See Structural 100% Checklist 	
Safety Certification			<ul style="list-style-type: none"> Project specific Safety & Security Management Plan Project specific Safety & Security Certification Plan Preliminary hazard analysis Threat and vulnerability assessment 	<ul style="list-style-type: none"> Updated project specific Safety & Security Management Plan Updated project specific Safety & Security Certification Plan Completed CIL list elements Updated preliminary hazard analysis Updated threat and vulnerability assessment 		<ul style="list-style-type: none"> CIL list completed 	<ul style="list-style-type: none"> Updated project specific Safety & Security Management Plan Updated project specific Safety & Security Certification Plan Safety & Security Program Plan system Integration test plant Pre-revenue operations and start-up plan
Station Experience Design Guidelines (SEDG)	<ul style="list-style-type: none"> Deliver comprehensive package of design to be reviewed for SEDG including at minimum: <ul style="list-style-type: none"> Basis of Design/Technical Memo Station area conditions and needs assessment baseline Station area maps (½ mile radius) and tabular data establishing thresholds for assignment; make initial access assignments; produce initial versions of primary outputs Conceptual station plan diagram GIS maps of 10-minute walkshed from center of station area with opening day and X year future land use/urban form Letter of concurrence/ understanding between ST and relevant agencies with arraying of land use and access types against the matrix in the SEDG 	<ul style="list-style-type: none"> Update comprehensive package of design to be reviewed for SEDG with minimum additional new documents: <ul style="list-style-type: none"> Initial TOD Feasibility Assessment Draft Station Context Framework Diagram No-build/ setback envelope Cross-section confirming necessary horizontal and vertical clearances Model priority and circulation framework layer Thematic Layer Draft Station Planning Report Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Perform Persona Workshop 1 for preferred alternatives and submit completed Persona Profiles 	<ul style="list-style-type: none"> Deliver comprehensive package of design to be reviewed for SEDG Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Update Persona Workshop Action Log Perform Targeted Persona Workshop as outlined in the SEDG and document results Provide updated Passenger Expectation Management Plan Signage Plan 	<ul style="list-style-type: none"> Evaluate design changes impacting passenger experience as outlined in the SEDG Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Re-perform the Persona Workshop if metric(s) in the Evaluation Matrix are rated 'Does Not Satisfy Guidelines' Update Persona Workshop Action Log if the Persona Workshop is re-performed Update Passenger Expectation Management Plan for proposed deviations 	<ul style="list-style-type: none"> Evaluate design changes impacting passenger experience as outlined in the SEDG Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Update Persona Workshop Action Log Produce new or updated Passenger Expectation Management Plan for proposed deviations 		

ENGINEERING DESIGN PROCEDURES
EP-03 Design Development, Submittal, and Review

Issued: 9/5/07
 Rev. 5 Date: 7/31/24

Design-Bid-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (CE) (5-10% Design)	Preliminary Engineering (PE) (30% Design)	Final Design (FD) (60%)	Final Design (FD) (90%)	Final Design (FD) (100%)	Issue for Bid (IFB)
	<ul style="list-style-type: none"> • Create Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions • Operating Scenario and Passenger Journey Mapping for preferred alternative • Static Passenger Model (Spreadsheet) - If there are special conditions associated with a station, such as an event station, terminus station, elevator-only station, etc. 	<ul style="list-style-type: none"> • Decision point / passenger flow diagrams for stations • Show decision points • Establish context • Identify FPZ • Show departure/ transfer/ arrival scenarios • Show elevator journey • Produce Passenger Expectation Management Plan for proposed deviations • Design principles not met • Passenger journey step (#) • Effect on passenger journey • Static Passenger Model (Spreadsheet) 					

Exhibit EP-03-02-B Design-Build Project Development Matrix

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
Decisions Frozen and Milestones Completed (Overview)	<ul style="list-style-type: none"> ✓ Roll plot level design defining footprint for each alternative ✓ Potential environmental impacts for each alternative ✓ Approval to advance to CE ✓ Concept of Operations drafted 	<ul style="list-style-type: none"> ✓ Completion of alternative analyses/ studies ✓ Draft environmental documentation ✓ Identify critical items that have significant impacts which take further design than CE to resolve ✓ The Preliminary Hazard Assessment (PHA) and Threat and Vulnerability Assessment (TVA) workshops begin with aim to identify safety or security fatal flaws in the initial designs ✓ Identify ROW takes for all alternatives ✓ Identify transit time for each alternative ✓ Identify station type for each location based on the Station Experience Design Guideline (SEDG) ✓ Identify bridge types for each location ✓ Identify operation access points along the guideway ✓ Third- party design mitigation plans finalized 	<ul style="list-style-type: none"> ✓ Single preferred alternative approved by the Board ✓ Request for Proposal (RFP) Project Requirements finalized ✓ Update Schedules ✓ Final environmental documentation and commitment list ✓ Baseline cost estimate and schedule ✓ Contract type selected ✓ Approval to advance to Final Design ✓ Right-of-way (ROW) opinion of probable cost ✓ Value Engineering (VE) workshops completed and ideas list being reviewed ✓ Utilities identified and connection locations identified ✓ Letter of concurrences identified for all impacted Authorities Having Jurisdiction (AHJs) ✓ Special track work identified ✓ Approved Requirements Management Plan ✓ Draft Interface Coordination and Integration Plan (ICIP) ✓ Identify design packaging plan ✓ Concept of Operations finalized 	<ul style="list-style-type: none"> ✓ Packaging plan 	<ul style="list-style-type: none"> ✓ Request for Deviations (RFDs) identified and submitted ✓ Specification Modification Requests (SMRs) identified and submitted ✓ Accepted Interface Coordination and Integration Plan (ICIP) ✓ Accepted Value Engineering (VE) ideas incorporated into design 	<ul style="list-style-type: none"> ✓ 3rd party review results incorporated into submittal ✓ Right-of-way (ROW) takes finalized ✓ Approved Requests for Deviations (RFDs) ✓ Approved Specification Modification Request (SMR's) ✓ All review comments resolved and documented ✓ Plans and Specifications are ready to be signed and sealed 	<ul style="list-style-type: none"> ✓ Plans and Specifications signed and sealed ✓ Requirements database approved
Environmental Review, Permitting, and Documentation	<ul style="list-style-type: none"> • Determine environmental impacts • Agency and public coordination conducted • Identify authority having jurisdictions 	<ul style="list-style-type: none"> • Update environmental impacts • Public Coordination conducted • Identify sustainability goals • Meet with the Cascade Water alliance to review irrigation and water conservation strategies and incentives for the project. • Incorporate recommendations into 30% submittal 	<ul style="list-style-type: none"> • Environmental commitment list updated. • Update sustainability checklist to align with Sound Transit expectations for design-builder • Draft code study for each discipline • Draft list of permits to be obtained by the Design Builder • Provide a written summary of all the sustainability goals proposed for the project. • Provide calculations, illustrations and/or other documentation to communicate projected performance. 	<ul style="list-style-type: none"> • Refer to 60% requirements • Design Builder to identify all permits required and establish submittal schedule • Summarize project strategies and commitments per the Sound Transit Sustainability Checklist. • Identify other or additional strategies and commitments that will be achieved by the project. (Whole project area.) • Provide updated LEED/ENVISION scorecard, credit by credit strategy and progress summary and 	<ul style="list-style-type: none"> • All environmental commitments identified in the contract documents • Update sustainability checklist and generate report. • Environmental commitments matrix update. • Provide final code analysis for each discipline, sealed and signed by the design professional of record. • 60% design plans for environmental mitigation elements as provided in Record of Decision 	<ul style="list-style-type: none"> • Environmental commitments matrix complete • Final design plans for environmental mitigation elements as provided in Record of Decision • Final design plans for sustainability and low impact development • Final design plans for wetland and sensitive areas • Letters of concurrence incorporated into sets • Provide a written project sustainability report summarizing strategies 	<ul style="list-style-type: none"> • Incorporate all conditions of the approved permit • Permit review comments incorporated • Code compliance memo/Fire Department and AHJ notes integrated in the construction documents • Submit Design Credits to GBCI for review • All seismic details and performance criteria integrated and clearly called out in the documents.

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
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			<ul style="list-style-type: none"> Provide LEED scorecard and LEED Management Plan Register Project with USGBC. Provide final Report from team eco-charrette Submit initial energy modeling results Identify and evaluate possible paths to improvement for possible inclusion into the project 	<p>LEED/ENVISION Management Plan</p> <ul style="list-style-type: none"> Provide initial Energy Analysis Report of the building(s). Establish the energy budget for the building(s). Provide project specific analysis. Identify dominant loads, usage patterns etc. Identify next level of possible energy efficient performance and provide cost benefit analysis for ST consideration. Establish projected water usage. Provide detailed breakdown of annual/monthly usage assumptions. Separate building potable and irrigation uses. Provide Draft Measurement & Verification (M&V) and Cx Plans if pursuing LEED credits. 	<ul style="list-style-type: none"> 60% design plans for sustainability and low impact development 60% design plans for wetland and sensitive areas Code compliance diagrams complete and incorporated into plan set Final list of permits to be obtained by the design builder Energy code compliance complete and integrated into design Seismic performance schedule incorporating ST's RM and ACSE 7 identifying essential systems and assigning importance factors for both attachment and functionality of devices and assemblies. 	<p>addressing facility design, construction and operation.</p> <ul style="list-style-type: none"> Include goals and plan to track and document construction related items identified in the Sound Transit Sustainability Checklist. (whole project area) Provide updated LEED scorecard and LEED Management Plan including documentation for Preliminary design review by GBCI Finalize Energy Analysis Report and projected annual monthly energy use budgets. Align budget categories with sub metering strategy. Finalize water budget and document water use reduction strategies. Provide estimated potable water usage reduction. Finalize M&V Plan 	
Facility Program Verification			<ul style="list-style-type: none"> Room by room Program listing - With each milestone submittal track Program NSF vs. Provided NSF. Indicate NSF on plans Program confirmation report documenting workshops with Sound Transit confirming final space by space requirements, functional relationships, equipment requirements, etc. as found in the Facility Program reconciled with the Proposer's design solution. Facility functional work flow diagrams illustrating design fulfills Facility Program requirements 		<ul style="list-style-type: none"> Update NSF calculations and Building GSF 	<ul style="list-style-type: none"> Final NSF for all spaces provided and indicated on plans. Validate NSF against code required clearance indicated on drawings. Workflow diagrams no longer required. 	<ul style="list-style-type: none"> Construction Documents shall include NSF for each program space on the plans and Contract definition of NSF in the Specifications.
Basis of Design			<ul style="list-style-type: none"> Prepare BOD report to accompany the drawings and submittals in support of the 30% design. Provide an understanding of the design assumptions and include references to technical decisions 		<ul style="list-style-type: none"> Finalize BOD report BOD must be accepted by ST Engineering and concurrence obtained from AHJs 	<ul style="list-style-type: none"> Submit Final BOD report 	

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
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			made during the course of the Work. <ul style="list-style-type: none"> Document fundamental design assumptions, criteria, issues encountered, design solutions considered, and design recommendations. The BOD is used for the development of the Request for Proposal (RFP). 				
Permits			<ul style="list-style-type: none"> Identify authority having jurisdictions Prepare draft list of required permits 	<ul style="list-style-type: none"> Identify all permits required; establish submittal schedule 	<ul style="list-style-type: none"> Energy Code Compliance complete and integrated into design Completed permit applications & supporting documents per AHJ land use code requirements/ permit checklists Draft list of permits to be obtained by contractor 	<ul style="list-style-type: none"> Implement permit conditions into 100% design 	<ul style="list-style-type: none"> Compile issued permits
Estimates (ICE)	<ul style="list-style-type: none"> Update project budget through the PE phase Preliminary estimation of ROW cost 	<ul style="list-style-type: none"> Update ROW costs based upon purchases 	<ul style="list-style-type: none"> Project baseline set Final ICE aligns with conformed RFP, inclusive of approved ROW requirements. 				
Specifications		<ul style="list-style-type: none"> Sound Transit Standard Specification edition selected for project 	<ul style="list-style-type: none"> Draft index of project Specifications; Division 00-34 specifications provided by Sound Transit 	<ul style="list-style-type: none"> Refer to 60% requirements Construction submittal list – Sound Transit will identify submittals where Sound Transit review is required as part of the RFP 	<ul style="list-style-type: none"> Draft specifications for all project elements of work Product cut sheets of any selected materials to be incorporated into the project Requests for Modifications to Sound Transit Standard Specifications Construction submittal list Adoption of Cx Specifications completed by designer 	<ul style="list-style-type: none"> Complete Specifications for all project elements of work coordinated and complete Final construction submittal list incorporating Sound Transit review items Specifications signed and sealed Adoption of Cx Specifications to be finalized by designer 	<ul style="list-style-type: none"> Completed, signed, and sealed
Asset Data Collection: Facilities		<ul style="list-style-type: none"> Sound Transit Facility Asset Data Collection Sheet (FADCS) formatted for project. Individual FADCS documents are required for: Stations & associated structures, Parking Garages & associated structures, Pedestrian Bridges & associated structures, Operations & Maintenance Facilities & associated structures, Maintenance of Way structures & associated structures, Administration 	<ul style="list-style-type: none"> Complete Tab-Z and adjust FADCS format as necessary to accommodate the to be constructed facility. 		<ul style="list-style-type: none"> On combined Tab A-Substructure B-Shell, and C-Interiors, and Tabs D-Conveying, E-Plumbing, F-HVAC, G-Fire Protection, H-Electrical, I-Equipment, and J-Site commence provision of data in assigned cells. For designated projects H.1-Electrical commence provision of data in assigned cells. Develop preliminary Door Schedule in format provided or agreed. 	<ul style="list-style-type: none"> Complete provision of data in assigned cells. Complete Door Schedule. Complete Interior Finish Schedule. 	

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
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		structures & associated structures, Park & Rides & associated structures, and Independent Ancillary Structures and Site Improvements not associated with any of the facility types listed above.			<ul style="list-style-type: none"> Develop preliminary Interior Finish Schedule in format provided or agreed. 		
Asset Data Collection: Linear		<ul style="list-style-type: none"> Sound Transit Linear Asset Data Collection Sheet (LADCS) formatted for project. 	<ul style="list-style-type: none"> N/A 		<ul style="list-style-type: none"> Commence provision of data in the tabs provided; Track/Bridge/Tunnel, OCS, Signal, TPSS, SCADA, Communication. 	<ul style="list-style-type: none"> Complete provision of data in assigned cells. 	
Spare Parts					<ul style="list-style-type: none"> Identify Spare parts needed in a draft spare parts list Get ST Operations review and feedback on the draft spare parts list 	<ul style="list-style-type: none"> Address comments and finalize spare parts list. 	
Warranty					<ul style="list-style-type: none"> Identify specific product warranties required in a draft list of warranties Get ST Operations review and feedback on the draft warranty list 	<ul style="list-style-type: none"> Address comments and finalize product warranties list. 	
Right-Of-Way (ROW)	<ul style="list-style-type: none"> Right of Entry (Right-of-entry (ROE)) request for environmental investigations, and ALTA survey for protective and early acquisitions of full acquisitions Basic high-level ROW requirements should be identified for each alternative and only permanent rights should be identified as full or partial acquisitions Identify protective and early acquisitions for partial and full acquisitions Order and review title reports for protective and early acquisitions, and request for ALTA surveys and ALTA surveys completed and unsigned at appraisal kickoff 	<ul style="list-style-type: none"> Right of Entry (Right-of-entry (ROE)) request for discovery activities and advance design Develop work plans for invasive ROE requests Refine the full acquisition for ROW requirements which include station sites, staging areas, and parking garage sites Order and review title reports for protective and early acquisition of full acquisitions, and request for ALTA surveys and have ALTA surveys completed and unsigned. In-progress ROW base mapping from GIS and record information and ROW strip maps at 1" = 200' Civil Certify the full acquisitions which include 	<ul style="list-style-type: none"> See ROW 30% Checklist 	<ul style="list-style-type: none"> Design support for property acquisitions, condemnations, trials 	<ul style="list-style-type: none"> Design support for property acquisitions, condemnations, trials. Support ROW closeout 	<ul style="list-style-type: none"> Design support for property acquisitions, condemnations, trials. Support ROW closeout 	<ul style="list-style-type: none"> Support ROW closeout

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
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	<ul style="list-style-type: none"> Sound Transit ROW Engineer to assign ROW No. 	certification deliverable schedule, parcel by parcel reviews, Civil Certification letter, parcel list, ROW plans, Letter of Concurrences – if available, ROW Title Report Review Memos completed					
Survey, Mapping, and Subsurface Utilities Engineering	<ul style="list-style-type: none"> Obtain existing GIS grade or better surveys and basemaps to utilize during CE Notate survey control details and source documents (meta data) with reports and drawing plan sets Utilities data collection and characterization designated by quality levels per ASCE 38-02 Survey methodology technical memo 	<ul style="list-style-type: none"> Project survey requirements identified, and area of impact identified for each alternative Project survey/mapping Local Datum Plane (LDP) identified or established. (Ground Coordinate System) Survey Horizontal and Vertical Control sheets developed Additional utilities data collection and characterization designated by quality levels per ASCE 38-02 	<ul style="list-style-type: none"> Translate survey and mapping efforts completed in CE to Established LPD Early in PE effort if this was not completed already by the end of CE Perform Survey support for Right of Way documents and deliverables included but not limited to Record of Surveys, ALTA, parcel maps, legal descriptions and sketches Design level existing conditions topographic and cadastral survey complete for preferred alternative, including above ground and underground utilities Update Survey Control Plan as necessary Horizontal and Vertical Control plans updated Additional utilities data collection and characterization designated by quality levels per ASCE 38-02 	<ul style="list-style-type: none"> See Project Requirements 	<ul style="list-style-type: none"> See Project Requirements 	<ul style="list-style-type: none"> See Project Requirements 	
Work Zone Traffic Control			<ul style="list-style-type: none"> Preliminary Traffic Control layouts Coordination with affected agencies 		<ul style="list-style-type: none"> Traffic Control plans showing construction sequence and staging 	<ul style="list-style-type: none"> Final Traffic Control plans completed Final detour plans complete Plans stamped and signed 	
Stormwater Management			<ul style="list-style-type: none"> Flow control, water quality, and conveyance capacity issues identified TS&L of stormwater management facilities including ROW needs Fish passage requirements Preliminary stormwater management report with supporting hydrologic calculations 	<ul style="list-style-type: none"> Code analysis to establish deliverables required by authority having jurisdiction Concurrence letter for vesting of design standard 	<ul style="list-style-type: none"> Stormwater management facility designs with typical cross sections Final Stormwater Management Report for preferred alternative Parcel maps for ROW and easements Coordination with Local Jurisdiction(s) to confirm connection points and services 	<ul style="list-style-type: none"> Construction details Updated drainage report (if changed) Plans stamped and signed Hydraulic Report approved by ST and Local Jurisdiction(s) Hydraulic plans should be complete PS&E All elements from the 60% plans should be updated 	<ul style="list-style-type: none"> As at 100% but finalized with additional details and updates to address 100% ST and 3rd party comments

ENGINEERING DESIGN PROCEDURES
EP-03 Design Development, Submittal, and Review

Issued: 9/5/07
 Rev. 5 Date: 7/31/24

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
			<ul style="list-style-type: none"> Storm water quantity and quality issues identified and documented Design Criteria identified Water quality requirements identified Conceptual storm water report prepared for each alternative Identify LID strategies TOD stormwater basis of design report. 		<ul style="list-style-type: none"> Hydraulic and water quality issues identified for each alternative Draft Final Hydraulic Report for preferred alternative Preliminary hydraulic report for each alternative Preliminary storm water management options to identify right-of-way needs LID strategies maximized and calculated and reviewed with AHJ 	<ul style="list-style-type: none"> Plans shall include all drainage details in order to construct the drainage system Final Hydraulic report shall be updated to represent the final design. LID strategies fully documented. 	
Sanitary Sewer			<ul style="list-style-type: none"> Conceptual sanitary sewer plan 	<ul style="list-style-type: none"> Existing conditions survey with supplemental as-built record information Updated conceptual sanitary sewer plan 	<ul style="list-style-type: none"> Preliminary sanitary sewer plan and profile with pipe diameter and slope Sanitary service line size and slope 		
Municipal Water			<ul style="list-style-type: none"> Conceptual water main plan with approximate hydrant locations 	<ul style="list-style-type: none"> Existing conditions survey with supplemental as-built record information 	<ul style="list-style-type: none"> Water plan with pipe diameter; fixtures; hydrant locations; service line location 		
Roadway/ Traffic Signing		<ul style="list-style-type: none"> Inventory completed (include associated electrical for sign lighting or flashing signs) for preferred alternative 	<ul style="list-style-type: none"> Preliminary layout of light standards and signal poles with signs Identify location of sign bridge structures (and its foundation) with concurrence on O&M of these sign bridge structures. 	<ul style="list-style-type: none"> Visual standards for corridor coordinated with Landscape Architect Sign layout completed including overhead signs Existing signs to reuse and relocated determined Conflicts with illumination and/or signal features, drainage, or utilities identified Service load and line loss calculations completed Potential conflicts between light standards and signal poles with signs identified for preferred alternative 	<ul style="list-style-type: none"> 90% signing plans should be complete PS&E Signing Plans, notes, sign specifications completed Coordination with luminaries on structure/wall identified and mounting or foundation details complete 	<ul style="list-style-type: none"> Plans stamped and signed 	

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
Geotechnical	<ul style="list-style-type: none"> Scoping level Geotechnical Memo complete. Regional geology reviewed and risk areas input into alignment alternative study. Identify probable types of guideway foundations and track support with recommendation for most likely type to be considered. Foundation type and layout for identified special structures and facilities. Develop recommendations for future work to support CE. Identify specific areas for further investigation. Right of entry requests and Permitting for geotechnical investigations in CE Phase. 	<ul style="list-style-type: none"> Conceptual Level Geotechnical Reports/Memos submitted. Geologic hazards identified and impact to project assessed for all alternatives. Historical and existing Geotechnical data collected and evaluated for all alternatives. Field Explorations necessary completed to inform risk assessment and cost estimate for geologic hazard, high-risk subsurface conditions, and high-risk or unusual structures or facilities that have the potential to impact preferred selection. Explorations in support of the DEIS completed and results incorporated into DEIS. Identify geotechnical high-level risks and potential mitigation strategies for guideway foundations, track support and station facilities. Develop recommendations for future work to support PE. Right of entry requests and Permitting for geotechnical investigations in PE Phase. 	<ul style="list-style-type: none"> See Geotechnical 30% Checklist 	<ul style="list-style-type: none"> See Geotechnical 60% Checklist 	<ul style="list-style-type: none"> See Geotechnical 60% Checklist 	<ul style="list-style-type: none"> See Geotechnical 90%/100% Checklist 	
Structures	<ul style="list-style-type: none"> Guideway type study report identifying the probable types of elevated guideway superstructure and substructure types with recommendations for the most likely types to be considered. Structural layouts for identified special structure areas. 	<ul style="list-style-type: none"> Identification of all existing structures affected by all alternatives. Identifications of impacts to existing structures requiring upgrades. Identification of locations, lengths, widths, and height of new structures for each alternative. 	<ul style="list-style-type: none"> See Structural 30% Checklist 	<ul style="list-style-type: none"> See Structural 60% Checklist 	<ul style="list-style-type: none"> See Structural 60% Checklist 	<ul style="list-style-type: none"> See Structural 90%/100% Checklist 	
Subsurface Utilities	<ul style="list-style-type: none"> Follow EP-15 	<ul style="list-style-type: none"> Follow EP-15 	<ul style="list-style-type: none"> Follow EP-15 	<ul style="list-style-type: none"> Follow EP-15 	<ul style="list-style-type: none"> Follow EP-15 	<ul style="list-style-type: none"> Follow EP-15 	<ul style="list-style-type: none"> Follow EP-15

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
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<p>System Integration</p> <p>(See Interface Coordination and Integration Plan and General Commissioning Plan for additional detail on submittal requirements.)</p>			<ul style="list-style-type: none"> Determine type, size and location for system elements Narrative of systems infrastructure requirements complete. Narrative of how "new work" ties into existing work Communications Rooms located Point of connection for main service location (manhole/ tunnel access) Identify impacts on areas to remain in service Communications/ systems program requirements communicated to design team Narrative of systems infrastructure requirements complete. Basis of Design Preliminary cable tray layout/size Location of door access card readers, ETEL's coordinate with Architecture plans Location of CCTV devices coordinate with Architecture plans 		<ul style="list-style-type: none"> Preliminary Communication Room details, elevations and grounding system Riser diagrams Preliminary backboard provisioning, penetration, locations and grounding system Systems related conduit shown Voice/Data Video utility outlet identified. Location and size: sleeves, cable tray conduit Systems coordination drawing Systems raceways sized and located Speaker/Sign/ Communication devices located. Raceway analysis (e.g. what's required) CCTV locations dimensioned, mounting details provided, pathway strategy communicated. Device mounting detailed and coordinated with Architecture Outlet schedule for infrastructure drafted CCTV locations dimensioned, mounting details provided, pathway strategy communicated. Device mounting detailed and coordinated with architecture See Prescriptive Specifications in Divisions 01, 26, 27, 28, and 34. 	<ul style="list-style-type: none"> Conduit runs to Ticket Vending Machine and all other systems infrastructure shown All previous submittal comments resolved. All ICD's resolved. All details completed. All Specifications completed. Plans stamped and signed Communication systems detailed and coordinated with Facility Design Systems related conduit shown, with penetration locations dimensioned. Voice/Data/Video utility outlet locations numbered Schedules final Transition details for cable trays/conduit sweeps Raceway locations dimensioned, and raceways detailed. Speaker/Sign/Comm devices located and shown on RCP's/Elevations/Plans, and conduit routing shown Systems related calculations complete and stamped. CCTV locations finalized and conduit runs (above) shown See Prescriptive Specifications in Divisions 01, 26, 27, 28, and 34. 	<ul style="list-style-type: none"> As at 100% but finalized with additional details and updates to address 100% ST and 3rd party comments Drawings signed, sealed and dated by WA registered design professionals See Prescriptive Specifications in Divisions 01, 26, 27, 28, and 34. After the IFC submittal, there are additional submittals required for the Systems Engineering work.
<p>Civil / Systems Integration</p>			<ul style="list-style-type: none"> Project Integration Implementation Plan (PIIP) 		<ul style="list-style-type: none"> As required by the PIIP Final System Schematic Drawings Final Interface Block Diagrams Preliminary Equipment Matrix Interface Control Documents (ICD) (on-going) 3D models Clash Detection Reports 	<ul style="list-style-type: none"> As required by the PIIP Composite drawings Combined service drawings Final Equipment circulation/access drawings Final Equipment Matrix Interface Control Documents (ICD) (on-going) Interface Checklists 3D models Clash Detection Reports 	<ul style="list-style-type: none"> As at 100% but finalized with additional details and updates to address 100% ST and 3rd party comments

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Testing & Commissioning			<ul style="list-style-type: none"> As required to support ATC. Commissioning coordinator qualifications 		<ul style="list-style-type: none"> Preliminary commissioning plan Preliminary Measurement and Verification Plan (LEED) Preliminary commissioning specifications Outline of all Operations and Maintenance Manuals 	<ul style="list-style-type: none"> Final commissioning specifications Final M&V Plan Final commissioning plan Commissioning schedule Draft of all Operations and Maintenance Manuals 	<ul style="list-style-type: none"> As at 100% but finalized with additional details and updates to address 100% ST and 3rd party comments Implementation of M&V Plan Final of all Operations and Maintenance Manuals. As at 100% but finalized with additional details and updates to address 100% ST and 3rd party comments
Safety Certification			<ul style="list-style-type: none"> Project specific Safety & Security Management Plan Project specific Safety & Security Certification Plan Preliminary hazard analysis Threat and vulnerability assessment 	<ul style="list-style-type: none"> Updated project specific Safety & Security Management Plan Updated project specific Safety & Security Certification Plan 	<ul style="list-style-type: none"> Completed CIL list elements Updated preliminary hazard analysis Updated threat and vulnerability assessment 	<ul style="list-style-type: none"> CIL list completed 	<ul style="list-style-type: none"> Updated project specific Safety & Security Management Plan Updated project specific Safety & Security Certification Plan Safety & Security Program Plan system Integration test plant Pre-revenue operations and start-up plan
Station Experience Design Guidelines (SEDG)	<ul style="list-style-type: none"> Deliver comprehensive package of design to be reviewed for SEDG including at minimum: <ul style="list-style-type: none"> Basis of Design/Technical Memo Station area conditions and needs assessment baseline Station area maps (½ mile radius) and tabular data establishing thresholds for assignment; make initial access assignments; produce initial versions of primary outputs Conceptual station plan diagram GIS maps of 10-minute walkshed from center of station area with opening day and X year future land use/urban form Letter of concurrence/ understanding between ST and relevant agencies with arraying of land use and access types against the matrix in the SEDG 	<ul style="list-style-type: none"> Update comprehensive package of design to be reviewed for SEDG with minimum additional new documents: <ol style="list-style-type: none"> Initial TOD Feasibility Assessment Draft Station Context Framework Diagram <ul style="list-style-type: none"> No-build/ setback envelope Cross-section confirming necessary horizontal and vertical clearances Model priority and circulation framework layer Thematic Layer Draft Station Planning Report Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Perform Persona Workshop 1 for preferred alternatives and submit completed Persona Profiles 	<ul style="list-style-type: none"> Deliver comprehensive package of design to be reviewed for SEDG Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Update Persona Workshop Action Log Perform Targeted Persona Workshop as outlined in the SEDG and document results Provide updated Passenger Expectation Management Plan Update Design Decision Log to reflect new or updated passenger experience-related design decisions Signage Plan 		<ul style="list-style-type: none"> Evaluate design changes impacting passenger experience as outlined in the SEDG Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Re-perform the Persona Workshop if metric(s) in the Evaluation Matrix are rated 'Does Not Satisfy Guidelines' Update Persona Workshop Action Log if the Persona Workshop is re-performed Update Passenger Expectation Management Plan for proposed deviations Update Design Decision Log to reflect new or updated passenger experience-related design decisions 	<ul style="list-style-type: none"> Evaluate design changes impacting passenger experience as outlined in the SEDG Updated Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions Update Persona Workshop Action Log Produce new or updated Passenger Expectation Management Plan for proposed deviations Update Design Decision Log to reflect new or updated passenger experience-related design decisions 	

Design-Build Project Development Matrix	Alternatives Identification	Conceptual Engineering (5-10%)	Preliminary Engineering (Request for Proposal Development) (30%)	Post-Award Submittal (Project/Engineering determines design development % submittal)	Final Design (60%)	Final Design (100%)	Issue for Construction (IFC)
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	<ul style="list-style-type: none"> • Create Evaluation Matrix from the SEDG to reflect passenger experience-related design decisions • Operating Scenario and Passenger Journey Mapping for preferred alternative • Static Passenger Model (Spreadsheet) - If there are special conditions associated with a station, such as an event station, terminus station, elevator-only station, etc. 	<ul style="list-style-type: none"> • Decision point / passenger flow diagrams for stations <ol style="list-style-type: none"> Show decision points Establish context Identify FPZ Show departure/ transfer/ arrival scenarios Show elevator journey • Produce Passenger Expectation Management Plan for proposed deviations <ol style="list-style-type: none"> Design principles not met Passenger journey step (#) Effect on passenger journey • Static Passenger Model (Spreadsheet) 					
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EXHIBIT EP-03-03

SUBMITTAL INTAKE FORM

Project Name:

Design Milestone Submittal:

Submission Package includes (stamped and signed for IFB/IFC):

- Complete Discipline Checklist Yes No N/A
- Drawings Yes No N/A
- Specifications Yes No N/A
- Reports Yes No N/A
- Calculations Yes No N/A
- Independent Cost Estimate Yes No N/A
- Quality Records Yes No N/A

Notes:

Any Submission Package missing required components will be returned to the Design Consultant Project Manager for resubmission. Please refer to the Project Development matrices, Exhibit EP-03-02-A and Exhibit EP-03-02-B, to determine completeness of the submittal.

All quality audit issues are resolved:

- Yes No

Bluebeam session for previous design milestone submittal is archived:

- Yes No

Intake is:

- Approved Rejected, resubmission required

Intake Completion Date:

Project Design Manager Signature:

APPENDIX A – DISCIPLINE SPECIFIC CHECKLISTS

- A. ARCHITECTURAL
- B. BUILDING MONITORING AND CONTROL
- C. CIVIL
- D. COMMUNICATIONS ACCESS CONTROL
- E. COMMUNICATIONS CCTV
- F. COMMUNICATIONS FARE VENDING
- G. COMMUNICATIONS NETWORK
- H. COMMUNICATIONS PA AND VMS
- I. COMMUNICATIONS PHONES
- J. COMMUNICATIONS RADIO
- K. COMMUNICATIONS SCADA
- L. COMMUNICATIONS TELECOMMUNICATION SPACE
- M. COMMUNICATIONS TIDS
- N. ELECTRICAL
- O. FIRE-LIFE SAFETY
- P. GEOTECHNICAL
- Q. GUIDEWAY STRUCTURAL
- R. LANDSCAPE
- S. LONG SPAN GUIDEWAY STRUCTURAL
- T. MECHANICAL
- U. RIGHT OF WAY
- V. STATION STRUCTURAL
- W. TRACK
- X. TRACTION ELECTRIFICATION
- Y. TRAIN CONTROL AND SIGNALS
- Z. TUNNELS

Note: For any discipline not specifically identified herein, the Designer shall develop checklists for each milestone submittal for ST review and written approval.

EP-03 CHECKLIST: ARCHITECTURAL – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

Codes and Standards:

ACTION	Y/N
1. Basis of Design memo has been drafted. (Final accepted if Design-Build)	
2. Produce code compliance summary sheet, including but not limited to applicable codes, occupancy classification, and construction type	
3. Produce code calculations and supporting diagrams per IBC, including exiting and any fire separation walls and ceilings/roofs/floors as needed	
4. Produce code calculations and supporting diagrams per IBC or NFPA 130 using Emergency Exiting Calculations spreadsheet	
5. Determine applicable energy code sections	
6. Produce building height calculations and supporting diagrams indicating maximum code limits, including average grade calculations and allowable square footage	
7. Determine, incorporate, and demonstrate building separation requirements	
8. Review, incorporate, and demonstrate accessibility code requirements, including handrails, mounting heights, and maneuvering clearance	
9. Obtain ridership projections from ST	
10. Obtain from ST existing LOCs early in the 30% design phase and incorporate into code compliance summary sheet	
11. Determine and pursue any additional LOCs with ST and incorporate into code compliance summary sheet	

List proposed Requests for Deviation, if any:

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Passenger Experience:

ACTION	Y/N
1. Provide comprehensive package of design to be reviewed for SEDG	
2. Update persona workshop action log and perform targeted persona workshop	
3. Produce Updated Evaluation Matrix as outlined in the SEDG based on previous reviews	
4. Produce Passenger Experience Expectation Management Plan for proposed deviations	
5. (For DB) Update Design Decision Log to reflect new or updated passenger experience-related design decisions	
6. Provide preliminary signage plan	

Sustainability:

ACTION	Y/N

7. Determine which sustainability certification system will be pursued, and any resulting design implications	
8. Follow certification-specific documentation process	

General:

ACTION	Y/N
1. Produce design narrative for Basis of Design memo	
2. Review proposed lighting fixtures with ST	

C. Interdisciplinary Coordination:

ACTION	Y/N
1. Coordinate with Mechanical, and incorporate clearances for conceptual ventilation schemes in drawings	
2. Coordinate with Structural, and ensure architectural plans account for conceptual structural design	
3. Elevator and escalator requirements accounted for and sizes coordinated	
4. Coordinate sector plan with all disciplines	
5. Coordinate with fall protection and building maintenance consultants for preliminary plans	

Description of interdisciplinary coordination efforts:

D. Specifications:

ACTION	Y/N
1. Outline specifications	

List Architectural Specifications:

E. Drawings:

Site Plans

ACTION	Y/N
1. Site plan with general dimensions and all program elements shown, including but not limited to: entry points, accessible routes within the site, pedestrian and bicycle access, paratransit, bus shelters, and adjacent roads	
2. Proposed bike storage areas sized and located on site plans and building plans	
3. Quantity and location of passenger pick-up and drop-off areas defined, including accessible drop-off	
4. Type and quantity of parking stalls where surface parking facilities have been determined	
5. Extent of hardscape illustrated and coordinated with Landscape	

6. Circulation diagrams developed	
7. Extent of property lines and required setbacks illustrated on site plans	

Floor Plans

ACTION	Y/N
1. Platform width determined based on alignment and vertical circulation requirements	
2. Program developed for required size, adjacency, and other requirements for each program element	
3. Ancillary spaces, sizes, and special adjacencies determined	
4. Floor plans with all programmed spaces shown, size and adjacencies indicated, rooms labeled and numbered; include general dimensions; doors and windows shown	
5. Stairs, elevators, and escalators located; pit, shaft and machine rooms conceptually sized and shown on plans	
6. Provide fall protection plan that has been prepared by qualified designer	

Elevations and Sections

ACTION	Y/N
1. Building elevations at 1/8" at a schematic level	
2. Building sections at 1/8" at a schematic level	

Enlarged Plans

ACTION	Y/N
1. Platform plans with key elements shown: general canopy size based on DCM requirements or ST design direction, vertical circulation, exit stairs, platform wind screens, benches, kiosks, and chases	
2. Preliminary layouts of entries and ancillary spaces @ 1/4"	

Provide notes on the implementation of ST Standard or Guidance Drawings:

F. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: ARCHITECTURAL– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

Codes and Standards:

ACTION	Y/N
1. Basis of Design memo updated	
2. Update code compliance summary sheet, including but not limited to applicable codes, occupancy classification, and construction type	
3. Update code calculations and supporting diagrams per IBC, including exiting and any fire separation walls and ceilings/roofs/floors as needed	
4. Update code calculations and supporting diagrams per IBC or NFPA 130 using Emergency Exiting Calculations spreadsheet	
5. Produce energy code calculations	
6. Update building height calculations and supporting diagrams indicating maximum code limits, including average grade calculations and allowable square footage	
7. Demonstrate building separation requirements are met	
8. Demonstrate accessibility code requirements are met, including handrails, mounting heights, and maneuvering clearance	
9. Complete Accessibility Design Review Checklist	
10. Confirm potential additional LOCs have been accepted by AHJ, and incorporate into code compliance summary sheet	

List proposed Requests for Deviation, if any:

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Passenger Experience:

ACTION	Y/N
1. Evaluate design changes impacting passenger experience as outlined in the SEDG	
2. Update Evaluation Matrix from the SEDG to reflect new or updated passenger experience-related design decisions	
3. Re-perform the Persona Workshop if metric(s) in the Evaluation Matrix are rated 'Does Not Satisfy Guidelines'	
4. Update Persona Workshop Action Log if the Persona Workshop is re-performed	
5. (For DB) Update Design Decision Log to reflect new or updated passenger experience-related design decisions	
6. Produce new or updated Passenger Experience Expectation Management Plan for proposed deviations	

Sustainability:

ACTION	Y/N
1. Follow certification-specific documentation process	
2. Integrate sustainability-based decisions into drawing set	
3. Coordinate material selection with certification requirements and credits being pursued	

General:

ACTION	Y/N
1. Update architecture and urban design to include decisions made at 30% design based on relevant concurrence and agreements	
2. Review signage plans with ST	
3. Review maintenance and access strategies with ST including fall protection approach	

C. Interdisciplinary Coordination:

ACTION	Y/N
1. Mechanical, electrical, and systems equipment selection coordinated for sizing of ancillary spaces, including equipment clearances	
2. Design fully coordinated with locations and sizes of Structural elements	
3. Coordinate with Electrical, Mechanical, Systems, and Structural for conduit, pipe, and duct routing and sizing of chases and floor, beam, column, and baseplate penetrations	
4. Horizontal and vertical dimensional controls established, coordinated with Structural and Civil, and indicated on drawings	
5. Lighting layouts coordinated with Electrical, and lighting calculations produced by Electrical	
6. Coordinate finish grade at building entrances and plaza areas with Civil	
7. Coordinate louver schedule with Mechanical	
8. Coordinate System elements	
9. Confirm elevator and escalator requirements accounted for and sizes coordinated with elevator consultant	
10. Hardscape elements coordinated with Landscape, and shown on drawings	
11. Acoustical Engineering coordinated into the documents, including: station and public area acoustics, facility and equipment sound mitigation coordinated and indicated on drawings	
12. Confirm architectural sector plans are consistent with other disciplines	
13. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
14. Coordinate fall protection and building maintenance systems	

Description of interdisciplinary coordination efforts:

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D. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings	

2. Requests for modification of the ST Standard Specifications submitted	
3. Material and color sample boards produced	
4. Color selections indicated	
5. All materials selections coordinated with drawings	
6. Preliminary door hardware schedules with sequence of operation and indicating any electrified hardware	
7. Material and equipment cut sheets provided	
8. For projects pursuing sustainability certifications, coordinate material selection with certification requirements and credits being pursued	

List any modification requests for ST Standard Specifications:

E. Drawings:

General:

ACTION	Y/N
1. All material selections shown on drawings and coordinated with specifications	

Site Plans:

ACTION	Y/N
1. Site plan with specific dimensions and all programs shown, including but not limited to: entry points, accessible routes within the site, pedestrian and bike access, paratransit, bus shelters, site customer signage, light poles, site furnishings, site stairs and ramps, vendor cart location, and adjacent roads	
2. Extent of hardscape shown, dimensioned, and coordinated with Landscape	
3. Bike storage lockers/systems shown in plan, with narrative on systems to be used included, and indicate current and future counts	
4. Layout of parking stalls and associated programs where surface parking facilities have been determined	
5. Confirm extent of property lines and required setbacks illustrated on site plans	
6. Location of temporary generator tap indicated	
7. All above ground utilities located and shown	
8. Code compliant building separation demonstrated as applicable	
9. Separate architectural site customer signage plan at 1/8" scale or larger, with all customer site signs identified and coordinated with signage schedule	
10. Sections of building site developed with specific dimensions that demonstrate key grade change conditions	
11. Key plan produced; sectors coordinated with all disciplines	
12. Circulation diagrams developed	

Floor Plans:

ACTION	Y/N
1. Floor plans at 1/8" dimensioned, furniture/fixtures/equipment shown with clearances identified; surge zones and platform edge clearances shown	
2. Walls, doors, windows, and louvers shown and tagged on plans	

3. All room and door numbers identified and indicated on plans	
4. Platform plans with key elements shown, dimensioned and detailed: canopies, vertical circulation, chases, conduit pathways, windscreens, benches, canopy support structure, information kiosk, including any project-specific elements	
5. Show location and size of all seismic joints	
6. Incorporate ventilation scheme in plans; coordinate with Mechanical	
7. Identify all locations that require bird deterrent throughout project	
8. Develop equipment circulation diagrams and coordinate with Electrical, Mechanical, and Systems	
9. Customer signage plans at 1/8" with ST standard signage call-outs	
10. Provide fall protection plan that has been prepared by a qualified designer	

Roof Plans:

ACTION	Y/N
1. Roof plans at 1/8" with drain and scupper locations; roof materials and roof slope identified	
2. Define roof mounted equipment and show preliminary locations, including roof access hatches, access locations, ladder tie-offs, and equipment paths	
3. Extent of fall protection and window washing equipment shown	

Ceiling Plans:

ACTION	Y/N
1. Reflected ceiling plans with lighting, mechanical vents, signage, speakers, CCTV, PIM's, exit signs, smoke and heat detectors, overhead coiling grilles, overhead fire risers, HVAC ducts, and overhead conduit 2"+ shown; coordinate with lighting calculations	

Finish Plans:

ACTION	Y/N
1. Finish plan layouts including tile layout, floor slopes and drains included, floor finish material callouts, extents of tactile wayfinding elements, and finish floor elevations	
2. Location of fare paid zone demarcations shown	
3. Locations of tactile warning strips shown for platform and bus loading where applicable	
4. Coordinate slab recesses for tile finishes with Structural	

Elevations and Sections:

ACTION	Y/N
1. Building elevations at 1/8" dimensioned, or increased scale to show work	
2. Building sections at 1/8" dimensioned, or increased scale to show work; including OCS poles, fences, sound walls, and contact wire no-touch zone and LRV dynamic envelope in cross sections	
3. Enlarged elevations of entries at 1/4"; including equipment, furnishings, fixtures, and customer signage	
4. Sections of entries and ancillary spaces at 1/4"; including equipment, furnishings, fixtures, and customer signage	

5. Typical wall sections, including any rated assemblies; coordinate with Structural; indicate thermal and moisture requirements	
6. Interior elevations of entry areas, ancillary spaces, and other critical locations at 1/4" dimensioned; including equipment, furnishings, fixtures, and customer signage	

Enlarged Plans and Details:

ACTION	Y/N
1. Enlarged plans of entries and ancillary spaces @ 1/4" with dimensions	
2. Enlarged elevator plans and sections, including elevator pits with sumps and ladders, elevator machine/control room, with dimensions, weights and reactions, and allowable deflection for rails	
3. Enlarged escalator plans and sections, including escalator control, intermediate supports, pit sumps, and drains shown with dimensions	
4. Enlarged stair plans and sections, with dimensions	
5. Canopies further developed and shown in plan, section, and elevation, with dimensions, and showing all electrical and systems elements	
6. Typical canopy details	
7. Roof and parapet details	
8. Guardrail, bike runnel, and handrail details	
9. Preliminary fall protection, ladder tie-off, and window washing equipment details	
10. Preliminary signage mounting details	
11. ADA mounting heights provided for all fixtures, signs, and equipment	
12. Other critical details addressed and included	
13. TVM's, ORCA Card Readers (SAFTP), PET's, ETEL's, door access card readers, PIM's, and DID's indicated in drawings, with mounting details	
14. Electrical and Systems routing coordinated and indicated in drawings; confirm chases sized to accommodate all elements, including conduit boxes, hangers, and conduit bends, and include size of chase with dimensions; preliminary critical details shown, including seismic joints	
15. Mechanical and sprinkler pipe routing and chases coordinated and indicated in drawings; include size of chase with dimensions; preliminary critical details shown, including seismic joints	

Schedules:

ACTION	Y/N
1. Room sign locations indicated	
2. Regulatory and Code signs identified and locations indicated	
3. Preliminary customer signage schedule, with numbering and mounting heights per Customer Signage Design Manual	
4. Wall type schedules with fire ratings, thermal requirements, tested assemblies, and dimensional controls shown	
5. Rated wall/floor/roof/ceiling penetrations with tested assembly indicated	
6. Curtainwall / Window schedule with glazing types identified and dimensions shown, U-value and SHGC factor indicated where needed	

7. Door schedule, including security access controls, fire ratings, U-value indicated where needed, preliminary hardware sets, door and frame types and materials indicated	
8. Louver schedule, with rough opening dimensions indicated and free area indicated and coordinated with Mechanical	
9. Preliminary finish schedule with all finishes; coordinated with specifications	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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F. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings	
2. Quantities provided to Project Manager for ICE development / update	

EP-03 CHECKLIST: ARCHITECTURAL– FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

Codes and Standards:

ACTION	Y/N
1. Basis of Design memo final	
2. Finalize code compliance summary sheet, including but not limited to applicable codes, occupancy classification, and construction type	
3. Finalize code calculations and supporting diagrams per IBC, including exiting and all fire separation walls and ceilings/roofs/floors as needed	
4. Finalize code calculations and supporting diagrams per IBC or NFPA 130 using Emergency Exiting Calculations spreadsheet	
5. Finalize energy code calculations and confirm compliance is shown in plans, sections, details, and schedules as required.	
6. Finalize building height calculations and supporting diagrams indicating maximum code limits, including average grade calculations and allowable square footage	
7. Confirm building separation requirements are met and demonstrated	
8. Finalize all accessibility code requirements, including handrails, mounting heights, and maneuvering clearance	
9. Finalize Accessibility Design Review Checklist	
10. Confirm potential additional LOCs have been accepted by AHJ, and incorporate into code compliance summary sheet	

List all approved Requests for Deviation, if any:

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Passenger Experience:

ACTION	Y/N
1. Evaluate design changes impacting passenger experience as outlined in the SEDG	
2. Update Evaluation Matrix from the SEDG to reflect new or updated passenger experience-related design decisions	
3. Update Persona Workshop Action Log if the Persona Workshop is re-performed	
4. (For DB) Update Design Decision Log to reflect new or updated passenger experience-related design decisions	
5. Produce new or updated Passenger Experience Expectation Management Plan for proposed deviations	

Sustainability:

ACTION	Y/N
1. Follow certification-specific documentation process	

2. Fully integrate sustainability-based decisions into drawing set	
3. Confirm material selection has been coordinated with certification requirements and credits being pursued	

General:

ACTION	Y/N
1. Update architecture and urban design to include decisions made at 60% design based on relevant concurrence and agreements	
2. All drawings and specifications complete and coordinated for constructability	

C. Interdisciplinary Coordination:

ACTION	Y/N
1. Final mechanical, electrical, and systems equipment coordinated with Mechanical and Electrical for final layouts of ancillary spaces, including equipment clearances	
2. Confirm all Architectural details have been coordinated with Structural details	
3. Confirm with Electrical, Mechanical, Systems, and Structural that conduit, pipe, and duct routing and sizing of chases and floor, beam, column, and baseplate penetrations are coordinated and accounted for in drawings	
4. Horizontal and vertical dimensional controls finalized and coordinated with Structural and Civil	
5. Final lighting layouts coordinated with Electrical, and lighting calculations produced by Electrical	
6. Finalize finish grade coordination with Civil at building entrances and plaza areas	
7. Final louver schedule coordinated with Mechanical	
8. Final door hardware schedule coordinated with door access requirements	
9. Final system elements have been coordinated	
10. Elevator and escalator requirements fully coordinated with elevator consultant and reflected in documents	
11. Hardscape elements coordinated with Landscape, and shown on drawings	
12. Final Acoustical Engineering requirements coordinated into the documents, including: station and public area acoustics; facility and equipment sound mitigation; operational noise and vibration; construction noise and vibration mitigation	
13. Confirm architectural sector plans are consistent with other disciplines	
14. Perform constructability review	

Description of interdisciplinary coordination efforts:

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D. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	
4. All material selections finalized, indicated, and coordinated with drawings	

5. Review and coordinate concrete, steel, and masonry specifications	
6. Confirm references to industry standards	
7. Confirm construction tolerances	
8. Final door hardware schedule coordinated with door access requirements, with sequence of operation and indicating any electrified hardware	
9. Material and equipment cut sheets provided	
10. For projects pursuing sustainability certifications, confirm material selection has been coordinated with certification requirements and credits being pursued	

E. Drawings:

General Guidelines for Drawings

ACTION	Y/N
1. All final material selections shown on drawings and coordinated with specifications	

Site Plans

ACTION	Y/N
1. Final site plan of station site with specific dimensions and all program elements shown, including but not limited to: entry points, accessible routes within the site, pedestrian and bike access, paratransit, bus shelters, site customer signage, light poles, site furnishings, site stairs and ramps, vendor cart location, and adjacent roads	
2. Finalized extent of hardscape shown, dimensioned, and coordinated with Landscape	
3. Bike storage lockers/systems finalized on plans; current and future counts indicated	
4. Final layout of parking stalls and associated programs where surface parking facilities have been determined	
5. Extent of property lines and required setbacks finalized on site plans	
6. Confirm location of temporary generator tap indicated	
7. Confirm all above ground utilities located and shown	
8. Confirm code compliant building separation demonstrated as applicable	
9. Final separate architectural site customer signage plan at 1/8" scale or larger, with all customer site signs identified and coordinated with signage schedule	
10. Sections of building site developed with specific dimensions that demonstrate key grade change conditions	
11. Final key plan; sectors coordinated with all disciplines	
12. Final circulation diagrams	

Floor Plans:

ACTION	Y/N
1. Final floor plans at 1/8" dimensioned, furniture/fixtures/equipment shown with clearances identified; surge zones and platform edge clearances shown	
2. Confirm wall, door, window, and louver type tags and graphics representation of assemblies are correctly indicated on plans and coordinated with schedules	
3. All room and door numbers finalized and indicated on plans	
4. Confirm rooms and doors have been sized to account for equipment circulation paths	

5. Final platform plans shown, dimensioned and detailed: canopies, vertical circulation, chases, conduit pathways, windscreens, benches, canopy support structure, information kiosk, including any project-specific elements	
6. Confirm location and size of all seismic joints	
7. Confirm final ventilation scheme shown in plans; coordinate with Mechanical	
8. Confirm all locations that require bird deterrent throughout project are identified	
9. Separate customer signage plans at 1/8" with ST standard signage call-outs	

Roof Plans:

ACTION	Y/N
1. Final roof plans at 1/8" with drain and scupper locations; roof materials and roof slope finalized	
2. Finalize roof mounted equipment locations, including locations of roof access hatches, access locations, and equipment paths	
3. Fall protection and window washing equipment locations shown with complete dimensions	

Ceiling Plans:

ACTION	Y/N
1. Final reflected ceiling plans with complete dimensions	
2. All ceiling elements, including lighting, sprinklers, mechanical vents, signage, speakers, CCTV, VMS, exit signs, smoke and heat detectors, overhead coiling grilles, overhead fire risers, HVAC ducts, and overhead conduit 2"+, indicated with complete dimensions on RCPs	
3. Complete dimensions where any ceiling elements, including those listed above, are visible on sections, elevations, and details	

Finish Plans:

ACTION	Y/N
1. Final finish plans including tile layout, floor slope and drain locations shown and coordinated with Plumbing; floor finish material callouts, tactile wayfinding elements, and finish floor elevations	
2. Floor finish plans coordinated and finalized with fare paid zone demarcations	
3. Locations of tactile warning strips shown for platform and bus loading where applicable	
4. Coordinate slab recesses for tile finishes with Structural	

Elevations and Sections:

ACTION	Y/N
1. Final building elevations at 1/8" dimensioned, or increased scale to show work	
2. Final building sections at 1/8" dimensioned, or increased scale to show work; including OCS poles, fences, sound walls, and contact wire no-touch zone and LRV dynamic envelope in cross sections	

3. Final enlarged elevations of entries at 1/4" dimensioned; including equipment, furnishings, fixtures and customer signage	
4. Final sections of entries and ancillary spaces at 1/4" dimensioned; including equipment, furnishings, fixtures, and customer signage	
5. Final interior elevations of entry areas, ancillary spaces, and other critical locations at 1/4" scale with complete dimensions; including equipment, furnishings, fixtures, and customer signage	
6. Finalize wall sections with complete dimensions, coordinated with Structural; indicate thermal and moisture requirements	
7. Horizontal and vertical dimensional control finalized on drawings	

Enlarged Plans and Details:

ACTION	Y/N
1. Final enlarged plans of entries and ancillary spaces @ 1/4" fully dimensioned; equipment and furnishings located; clearances shown; room, wall, door, window, and louver callouts indicated	
2. Final elevator plans and sections, including elevator pits with sumps and ladders; and machine/control room; fully dimensioned, with weights and reactions, and allowable deflection for rails	
3. Final escalator plans and sections, including escalator control, intermediate supports, pit sumps, and drains shown with complete dimensions	
4. Final details for elevators, including pit MEP requirements, elevator user controls, elevator cab details	
5. Final details for escalator requirements, including pit MEP requirements	
6. Final enlarged stair plans and sections, with complete dimensions and final details	
7. All wall types, floor types, and roof types finalized and detailed	
8. Confirm wall, floor, and ceiling/roof details illustrate compliance with energy code	
9. Finalize guardrail, bike runnel, and handrail details	
10. Canopies finalized and shown in plan, section, and elevation, with complete dimensions; integration of all signage, communications, security, fire alarm and sprinklers, electrical, lighting, and conduit routing for electrical and comm finalized, coordinated, and included	
11. Canopy details finalized, including attachments, gutters, downspouts, and flashing	
12. Roof and parapet details complete with complete dimensions	
13. Roof access hatch and additional access hardware details finalized	
14. Fall protection, ladder tie-off, and window washing equipment details finalized	
15. Skylight details complete with dimensions	
16. Bike storage system attachment / mounting details completed	
17. Complete tiling details	
18. Signage mounting details finalized and coordinated with Structural	
19. All details addressed and included	
20. ADA details complete for building and site related items	
21. Seismic building joints detailed and coordinated with Structural and finalized, including conduit and plumbing/sprinkler detailing at seismic joints	
22. Bird deterrent methods finalized and detailed	
23. Interior details and sections at complex plan, wall, and ceiling areas finalized	

24. TVM's, ORCA Card Readers (SAFTP), PET's, ETEL's, door access card readers, PIM's, and DID's locations finalized, mounting details completed, and conduit pathway details finalized	
25. Electrical and Systems routing coordinated and finalized; confirm chases sized to accommodate all elements, including conduit boxes, hangers, and conduit bends, and include dimensions; show finalized details, including seismic joints	
26. Mechanical and sprinkler pipe routing and chases coordinated and finalized; include size of chase with dimensions, final details, including seismic joints	
27. Fire valve cabinets detailed and fire extinguishers located	

Schedules:

ACTION	Y/N
1. Room sign locations finalized; complete room sign schedule with text	
2. Regulatory and Code sign locations finalized; complete Regulatory and Code sign schedule with text; final sign supports detailed and dimensioned	
3. Customer sign locations finalized; complete Customer sign schedule with numbering and mounting heights per Customer Signage Design Manual; including customer signage at bus stops, paratransit, and drop-off / pick-up zones	
4. Final wall type schedules with fire ratings, thermal requirements, tested assemblies, and dimensional controls shown.	
5. Rated wall/floor/roof/ceiling penetrations with tested assembly indicated	
6. Final curtainwall / window schedule with glazing types identified and dimensions shown, U-value and SHGC factor indicated where needed, with complete details	
7. Final door schedule, including security access controls, fire ratings, U-value indicated where needed, final hardware sets, door and frame types and materials indicated	
8. Final louver schedule coordinated with Mechanical, with rough opening dimensions indicated and free area indicated and coordinated with Mechanical	
9. Final finish schedule with all finishes; coordinated with specifications	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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F. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: BUILDING MONITORING AND CONTROL – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design report has been submitted with sufficient detail to define the strategy for building monitoring and control. Including operational approach and system architecture. The design memo shall reference all applicable codes and specific requirements that support the design concept. All assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategy and system description, c) Assumptions d) Code compliance and identification of areas of concern e) Identify any design elements that specifically mitigate hazards identified in Preliminary Hazard Assessments f) Sustainability scope of work identified by the Sustainability Checklist. Account for fault detection and diagnostics (FDD) and energy monitoring. g) Coordinate with Fire Life Safety on initial draft of Emergency Response Matrix (ERM) h) Coordinate with comms on identifying network topology strategy	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Not Applicable	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Develop designs and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual, including conduit routing and wire conduit schedules.	
3. Confirmed specified equipment complies with Buy America requirements	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination initiated with respective disciplines. Identify any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a) Point to Point responsibility diagrams are complete. b) Interface Block Diagrams drafted with Concept of Operations outlined. c) Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers.	
3. Interfaces defined and coordinated: a) Preliminary equipment space proofing b) Preliminary electrical coordination of equipment power requirements including any special requirements.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Table of Contents for planned specifications	
2. List of potential or planned Specification Modification Requests	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. Floor plans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table.	
4. Block diagrams are provided for all systems.	
5. Communications rooms and bungalows shown on plans.	
6. Preliminary Riser diagram – Reference Design Technology Manual (DTM)	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities:

ACTION	Y/N
1. Support development of preliminary Equipment Matrix as part of Project Integration Implementation Plan (PIIP)	

EP-03 CHECKLIST: BUILDING MONITORING AND CONTROL – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Report updated to a FINAL state.	
2. Technical memoranda have been reviewed by ST and approved. List final titles and revisions below.	
3. Known Letters of Concurrence have been drafted or completed. List below and state status.	
4. Design identifies ICDs (Interface Control Documents). Respond to ICDs requiring input from design.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Panel Heating Calculations	
2. IO Counts Completed	
3. Panel sizing	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Responded to and addressed all issues identified in previous Constructability Reviews.	
4. Equipment designed included in Clash Detection models.	
5. Participate in and resolve issues identified in Gap Analysis of BIM models.	
6. Confirmed specified equipment complies with Buy America requirements.	

7. Support further development of Equipment Circulation Diagrams.	
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E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% level resolved.	
2. Interdisciplinary coordination ongoing to inform submittal included:	
a) Coordination with Architectural for energy code compliance, identification of heated/conditioned spaces, space planning, pathway routing, wall penetrations, lighting fixture locations, equipment chases, and equipment access.	
b) Coordination with structural including structural loads of equipment if required, equipment concrete pad locations, seismic/thermal expansion joints etc. All conflicts identified and resolved.	
c) Coordination with electrical including definition of inputs/outputs to electrical systems.	
d) Coordination with fire alarm including definition of inputs/outputs between fire alarm system.	
e) Coordination with mechanical design systems including sequences of operation for equipment and definition of inputs/outputs to mechanical systems.	
3. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables:	
a) Interface Block Diagrams at a pre-final status with Concept of Operations outlined.	
b) Support development of Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring.	
c) Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents.	
d) Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers.	
e) Participate in Gap Analysis using BIM model.	
4. Coordinate with Fire Life Safety design for functionality, reliability, and control engineering analysis for input into tunnel emergency ventilation, stairwell pressurization, and alarm notification and emergency voice message system.	

List ICDs:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Drawings are coordinated with the specifications: <ul style="list-style-type: none"> a. Terminology is consistent between the two disciplines b. Specified materials and products are compatible between the two disciplines 	
3. Keyplans and general arrangement plans shown with labels and sectors identified	
4. Electrical service location, type, and size shown in plans and summary table. Include speakers, signs, other communications devices	
5. Control diagrams are provided for all systems.	
6. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
7. Cabinet / Enclosure details shown and dimensioned	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
9. Preliminary wire notes, and wire and conduit schedule is provided.	
10. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans	
11. Riser diagrams are provided for all systems.	
12. Construction notes on layout sheets are provided.	
13. Standard and special detail drawings and specifications are provided.	
14. Interface Terminal Cabinets and On-Board Enclosures located	
15. Power service locations, and panel service details provided	
16. IO List Defined	
17. Sequence of Operation Diagrams - Draft	
18. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Included equipment in Equipment Matrix as part of integration efforts.	
2. Specifications include identification of spare parts and equipment to be supplied.	

EP-03 CHECKLIST: BUILDING MONITORING AND CONTROL – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Finalized at 60%).	
2. Technical memoranda have been reviewed by ST and approved. List final titles and revisions below.	
3. Known Letters of Concurrence drafted or completed. List below and state status.	
4. Design incorporates disposition of resolved ICDs (Interface Control Documents). Respond to ICDs requiring input from design.	
5. Incorporation of all identified and approved sustainability features. This should include provisions for Fault Detection and Diagnostics (FDD) and Energy Monitoring.	

List all approved Requests for Deviation, if any:

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List all approved Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Panel heating calculations completed.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Confirm specified equipment complies with Buy America Requirements	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues resolved and complete	
2. Interdisciplinary coordination complete:	
a) Coordination with Architectural for energy code compliance, identification of heated/conditioned spaces, space planning, pathway routing, wall penetrations, lighting fixture locations, equipment chases, and equipment access.	

b) Coordination with structural including structural loads of equipment if required, equipment concrete pad locations, seismic/thermal expansion joints etc. All conflicts identified and resolved.	
c) Coordination with electrical including definition of inputs/outputs to electrical systems.	
d) Coordination with fire alarm including definition of inputs/outputs between fire alarm system.	
e) Coordination with mechanical design systems including sequences of operation for equipment and definition of inputs/outputs to mechanical systems.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated.	
2. Specifications complete and coordinated with the drawings.	
3. Incorporate all previously approved ST Standard Specification modification requests. Complete all Standard Specification modifications, including tailoring commissioning specifications to the design and project and identification of Integrated Testing needs for the design.	

G. Drawings:

ACTION	Y/N
1. Drawings as outlined in the Design Technology Manual are completed and all comments that have been agreed upon are already incorporated.	
2. Drawings are coordinated with the specifications: <ul style="list-style-type: none"> a. Terminology is consistent between the two disciplines b. Specified materials and products are compatible between the two disciplines 	
3. Temporary communications plan completed	
4. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Included equipment in Equipment Matrix as part of integration efforts.	
2. Specifications include identification of spare parts and equipment to be supplied.	

EP-03 CHECKLIST: CIVIL – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design report has been drafted (Final accepted if Design-Build)	
2. Agreement on WSDOT <i>Project File</i> elements for roadway work on WSDOT ROW including will be applicable: Design Approval Package and Design Documentation Package (see WSDOT Design Manual Division 300).	
3. Identify any potential Design Analyses.	
4. Safety and Security Management Plan (draft)	
5. Identify and concur on standards for all engineering disciplines	
6. Surveying, Mapping, and Monument Control for draft project basemap completed for review.	
7. Hydraulics Report draft (Final accepted if Design-Build)	
8. Sub-surface Utility Easement (SUE) draft Report	
9. Traffic Analysis Report draft (Final accepted if Design-Build)	
10. At-Grade Crossings (If any) Diagnostic draft Report	
11. At-Grade Crossings (If any) Illumination draft Report	
12. Pavement design and surfacing report draft completed for review	
13. TS&L of stormwater management facilities including ROW needs	
14. Identify Fish passage barrier structures and removal requirements	
15. Technical memoranda drafted for review (Final accepted if Design-Build)	
16. Major environmental features identified and surveyed i.e. 100-year flood plain, wetlands, critical areas.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Roadway design parameters in draft form for review (WSDOT facilities, if applicable)	
2. Roadway Basis of Design in draft form for review (WSDOT facilities, if applicable)	
3. Flow control, water quality, and conveyance capacity issues identified	
4. Draft parking study and/or Traffic Impact Analysis	
5. Signing inventory completed for review	
6. Preliminary conveyance design with calculations	

7. Preliminary surface water quantity and quality design with calculations.	
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D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified by project team	
2. Constructability reviews, contacts, and scheduling initiated	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is initiated including: <ul style="list-style-type: none"> a. Planned dates of IDCRs b. Disciplines Included c. Members contacted 	
2. Utility investigations initiated and agencies contacted	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline Specifications	

G. Drawings:

ACTION	Y/N
1. General Sheets drafted including: <ul style="list-style-type: none"> a. Project Title b. Vicinity Map c. Begin and End of Project d. General Notes e. Symbols Legend and Abbreviations f. Coordinate Systems and Project Datum g. Date of Print h. Date of Submittal 	
2. Roadway Typical Sections draft: <ul style="list-style-type: none"> a. Draft dimensions, depths, and identification of roadway section items in project limits, curb, gutter, roadside safety items, slopes, catch lines, etc. b. Locations of profile, grade, and pivot point in roadways 	
3. Contour Grading Plans and Sections draft: <ul style="list-style-type: none"> a. Draft limits of proposed grading 	
4. Stage Construction Plans concept: <ul style="list-style-type: none"> a. Concept stage construction plans initiated for discussions 	
5. Alignment Sheets draft–Roadway: <ul style="list-style-type: none"> a. Draft Roadway Horizontal alignments b. Township and Range 	

c. Right of Way lines	
6. Temporary Erosion and Sediment Control (TESC): a. NA	
7. Site Preparation and Demolition Plan and Details draft: a. All existing surveyed topography b. Draft demo work c. Draft removals d. Draft limits of work	
8. Existing Utilities: a. All known existing surveyed, or otherwise located including ownership.	
9. Roadway Profiles and Superelevation draft: a. Draft finished grade roadway vertical alignments b. Finished grade curve design and grades c. Existing ground line under/over all profiles	
10. Drainage Plans, Profiles, Structure Notes, and Details draft: a. Draft drainage plans and profiles b. Draft water crossing structure and creek plans and profile c. Draft location of drainage structures to be constructed d. Inlet and outlet flow line locations e. General Notes including information required to complete the data for drainage features f. Coordination initiated with known foundations, structures, ground penetrations, etc.	
11. Utility Plans – Storm, Sewer, Water, Gas, Comm, Other, and Details draft: a. Concept utility relocation plan b. Known utility crossings and potential conflict resolution initiated c. Coordination initiated with known foundations, structures, ground penetrations, etc. d. Coordination with utility agencies initiated	
12. Paving Plans and Details draft: a. Draft paving limits plan b. Tie in locations between new construction and existing	
13. Traffic Signal Plans and Details draft: a. Draft signal modification plans b. Owning agencies contacted regarding potential traffic signals modifications	
14. Signing and Markings Plans, Details, and Sizing: a. NA	
15. Traffic Control Plans Concepts: a. Concept proposed traffic control plans for discussion b. Consideration given to typical traffic control Plans found in MUTCD, or other local jurisdiction standard plans c. Review of local jurisdictions involved, initiated coordination	
16. Detour Plans: a. Draft Illumination Plans	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: CIVIL – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo has been updated.	
2. WSDOT and FHWA <i>Project File</i> for roadway work on WSDOT ROW submitted for review including when applicable: Design Approval Package and Design Documentation Package (see WSDOT Design Manual Division 300).	
3. Safety and Security Management Plan (updated)	
4. Draft Hydraulics Report	
5. Draft Traffic Analysis Report	
6. Sub-surface Utility Easement (SUE) updated Report	
7. At-Grade Crossings (If any) Diagnostic updated Report	
8. At-Grade Crossings (If any) Illumination updated Report	
9. Draft Letter of Agreement or Understanding issued to utilities requiring relocation	
10. Final pavement design and surfacing report for incorporation in to designs	
11. Draft stormwater management report	
12. Technical memoranda have been submitted, reviewed, and approved.	
13. Concurrence exhibit for paving limits and O&M responsibilities of roadway	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Updated roadway design parameters draft form for 2 nd review, agency comments incorporated (WSDOT facilities, if applicable)	
2. Roadway Basis of Design in draft form for 2 nd review (WSDOT facilities, if applicable)	
3. Preliminary cut/fill quantities with supporting calculations	
4. Intermediate conveyance design with calculations	
5. Intermediate surface water quantity and quality design with calculations.	

D. Constructability

ACTION	Y/N
1. Constructability reviews completed, issues documented, resolutions initiated	
2. Complies with RFP requirements including ST approved construction sequencing (if any) (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary reviews in progress: <ul style="list-style-type: none"> a. Dates of IDCR b. Disciplines Included c. Documentation included in Project File 	
2. Utility relocation coordination in progress	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings for Final Review:

ACTION	Y/N
1. General Sheets updated drafts including: <ul style="list-style-type: none"> a. Project Title b. Vicinity Map c. Begin and End of Project d. General Notes e. Symbols Legend and Abbreviations f. Coordinate Systems and Project Datum g. Date of Print h. Date of Submittal 	
2. Roadway Typical Sections updated draft: <ul style="list-style-type: none"> a. Draft dimensions, material identification and depths, and identification of all roadway section items in project limits, curb, gutter, roadside safety items, slopes, catch lines, etc. b. Locations of profile, grade, and pivot point in roadways 	
3. Contour Grading Plans and Sections updated draft: <ul style="list-style-type: none"> a. Existing and finished grade ground contours at 1' intervals, or as required to adequately detail proposed construction b. Limits of work defined 	

<p>4. Stage Construction Plans draft:</p> <ul style="list-style-type: none"> a. Draft stage construction plans and details b. Stages of work shown in logical and clear rationale to complete the construction c. Contractor work zones identified for each stage d. Active traffic zones identified for each stage e. Active rail zones identified for each stage f. Description of construction work in each stage g. Construction access locations shown for each stage h. Constructability review comments incorporated and/or resolved 	
<p>5. Alignment Sheets –Roadway updated draft:</p> <ul style="list-style-type: none"> a. Draft Roadway horizontal alignments b. Project monumentation control included c. Monument descriptions, northings, eastings, elevation d. Township and Range e. Alignment curve data and P.I. coordinates f. Right of Way lines 	
<p>6. Temporary Erosion and Sediment Control (TESC) draft:</p> <ul style="list-style-type: none"> a. Draft TESC plans and details 	
<p>7. Site Preparation and Demolition Plan and Details updated draft:</p> <ul style="list-style-type: none"> a. All existing surveyed topography b. Demo work and details c. Tree removals d. Roadway and associated structure removals e. Limits of work 	
<p>8. Existing Utilities updated:</p> <ul style="list-style-type: none"> a. All known existing surveyed, or otherwise located, utilities within and/or impacted by the area of construction 	
<p>9. Roadway Profiles and Superelevation updated draft:</p> <ul style="list-style-type: none"> a. Draft finished grade roadway vertical alignments b. Finished grade curve design and grades c. Existing ground line under/over all profiles d. Superelevation diagrams 	
<p>10. Drainage Plans, Profiles, Structure Notes, and Details updated draft:</p> <ul style="list-style-type: none"> a. Draft drainage plans, profiles, notes, and details b. <u>Draft Water crossing structure and creek plans and profile</u> c. <u>Draft Mitigation plan for potential adverse impacts i.e. zero rise, wetlands.</u> d. Horizontal and vertical location of all drainage structures to be constructed e. Inlet and outlet flow line locations, elevations and slopes f. Sizes and material types of all drainage structures to be constructed g. Finished ground line above the drainage structures h. Draft structure note sheets i. Coordinated with all foundations, structures, ground penetrations, etc. j. Draft Stream isolation and diversion plan if needed. 	
<p>11. Utility Plans – Storm, Sewer, Water, Gas, Comm, Other, and Details updated draft:</p> <ul style="list-style-type: none"> a. Draft utility relocation plans b. All known utility crossings and potential conflicts noted c. Draft stormwater management facility 	

<ul style="list-style-type: none"> d. Draft sanitary sewer plan and profile with structure type and size; rim elevations; e. Water plan and profile; service line diameter and meter sizes f. Coordinated with all foundations, structures, ground penetrations, etc. 	
<p>12. Paving Plans and Details updated draft:</p> <ul style="list-style-type: none"> a. Draft roadway and pavement dimensions including elements such as: shoulder widths, taper lengths and widths, widening for guardrail, locations of concrete barrier, guardrail, impact attenuators, traffic islands, etc. b. Curb return locations c. Tie in locations and details between new construction and existing 	
<p>13. Traffic Signal Plans and Details updated draft:</p> <ul style="list-style-type: none"> a. When Traffic Signal Plans are required for WSDOT owned infrastructure they are typically provided by either the Region Traffic Office or the HQ Traffic Office for incorporation into the project construction b. For traffic signals owned and operated by other local agencies, refer to their respective guidelines. 	
<p>14. Signing and Markings Plans, Details, and Sizing updated draft:</p> <ul style="list-style-type: none"> a. Draft signing and marking plans, notes, schedules b. Location of signage and pavement markings c. Mounting and foundation design d. Signs coordinated with structures/walls and mounting and/or foundations e. Identify non-standard signs and markings f. Power source identification and locations for illuminated signs g. Draft signing design for overhead sign bridges, cantilevers, and other structures h. Locations of overhead signs in relation to lanes i. Draft sign removals and relocation plans 	
<p>15. Traffic Control Plans draft:</p> <ul style="list-style-type: none"> a. Draft traffic control plans b. Particular consideration given to public safety, worker safety, and maintaining mobility for vehicles, bicyclists, and pedestrians (including pedestrians with disabilities) through or around a work zone c. Consideration given to typical traffic control Plans found in MUTCD, or other local jurisdiction standard plans d. Location, size, color, and spacings e. Review and agreement of local jurisdictions documented 	
<p>16. Detour Plans draft:</p> <ul style="list-style-type: none"> a. Draft detour routes and signing plans b. Location, size, color, and spacings c. Updated Illumination plans d. Review and agreement of local jurisdictions documented 	
<p>17. All comments from previous submittals incorporated and/or resolved</p>	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
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1. Developed based on updated drawings and specifications.	
2. Quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: CIVIL – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Final Basis of Design memo.	
2. WSDOT and FHWA Approved <i>Project File</i> for roadway work on WSDOT ROW including when applicable: Design Approval Package and Design Documentation Package (see WSDOT Design Manual Division 300).	
3. Surveying and Mapping Applicable permits from Authorities having jurisdiction, (e.g.: DNR, WSDOT, County, City, etc.), for destroying and resetting monuments, as needed.	
4. Final Safety and Security Management Plan (SSMP)	
5. Final Hydraulics Report	
6. Final Traffic Analysis Report	
7. Final Sub-surface Utility Easement (SUE) Report	
8. Final At-Grade Crossings (If any) Diagnostic Report	
9. Final At-Grade Crossings (If any) Illumination Report	
10. Final Letter of Agreement or Understanding issued to utilities requiring relocation	
11. Final pavement design and surfacing report incorporated	
12. Technical memoranda have been submitted.	
13. Draft Operation and Maintenance Manual.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Cut cross sections from modelling at typical intervals (50 ft) and critical sections	
3. Final cut/fill quantities with supporting calculations	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	

E. Interdisciplinary Coordination:

ACTION	Y/N

1. Interdisciplinary coordination with other disciplines is complete and includes: <ul style="list-style-type: none"> a. Dates of IDCR b. Disciplines Included c. Documentation included in Project File 	
2. Utility relocation and schedule monitored and coordination complete	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings for Final Review:

ACTION	Y/N
1. General Sheets updated including: <ul style="list-style-type: none"> a. Project Title b. Vicinity Map c. Begin and End of Project d. General Notes e. Symbols Legend and Abbreviations f. Coordinate Systems and Project Datum g. Date of Print h. Date of Submittal i. Engineering Stamp (typ. all sheets) 	
2. Roadway Typical Sections updated: <ul style="list-style-type: none"> a. Complete final dimensions, material identification and depths, and identification of all roadway section items in project limits, curb, gutter, roadside safety items, slopes, catch lines, etc. b. Locations of profile, grade, and pivot point in roadways 	
3. Contour Grading Plans and Sections updated: <ul style="list-style-type: none"> a. Fine grading spot elevations as necessary b. Finished and existing grade ground contours (1 ft contours) c. Complete limits of work 	
4. Stage Construction Plans updated: <ul style="list-style-type: none"> a. Complete final stage construction plans and details b. Stages of work shown in logical and clear rationale to complete the construction c. Contractor work zones identified for each stage d. Active traffic zones identified for each stage e. Active rail zones identified for each stage f. Description of construction work in each stage g. Construction access locations shown for each stage h. Constructability review comments incorporated and/or resolved 	

<p>5. Alignment Sheets –Roadway updated:</p> <ul style="list-style-type: none"> a. Complete final Roadway Horizontal b. Final project monumentation control included c. Monument descriptions, northings, eastings, elevation d. Township and Range e. Alignment curve data and P.I. coordinates f. Slope catch lines g. Right of Way lines 	
<p>6. Temporary Erosion and Sediment Control (TESC) updated:</p> <ul style="list-style-type: none"> a. Complete final TESC plans and details 	
<p>7. Site Preparation and Demolition Plan and Details updated:</p> <ul style="list-style-type: none"> a. All existing surveyed topography b. Complete final demo work and details c. Complete final tree removals d. Complete final roadway and associated removals e. Complete limits of work 	
<p>8. Existing Utilities updated:</p> <ul style="list-style-type: none"> a. All known existing surveyed, or otherwise located, utilities within and/or impacted by the area of construction 	
<p>9. Roadway Profiles and Superelevation updated:</p> <ul style="list-style-type: none"> a. Complete final finished grade roadway vertical alignments b. Finished grade curve design and grades c. Existing ground line under/over all profiles d. Superelevation diagrams 	
<p>10. Drainage Plans, Profiles, Structure Notes, and Details updated:</p> <ul style="list-style-type: none"> a. Complete final drainage plans, profiles, notes, and details b. Complete Water crossing structure and creek plans, profile, notes, and details c. Mitigation plan for potential adverse impacts i.e. zero rise, wetlands d. Horizontal and vertical location of all drainage structures to be constructed e. Inlet and outlet flow line locations, elevations and slopes f. Sizes and material types of all drainage structures to be constructed g. Finished ground line above the drainage structures h. Structure Note sheets tabulating locations, bid items, quantities, and notes pertaining to drainage items, utilities, water lines, etc. i. General Notes including information required to complete the data for drainage features j. Coordinated with all foundations, structures, ground penetrations, etc. k. Stream isolation and diversion plan if needed. 	
<p>11. Utility Plans – Storm, Sewer, Water, Gas, Comm, Other, and Details updated:</p> <ul style="list-style-type: none"> a. Complete final utility relocation plan b. All known utility crossings and potential conflicts noted and resolved c. Detailed stormwater management facility d. Sanitary sewer plan and profile with structure type and size; rim elevations; e. Water plan and profile; service line diameter and meter sizes f. Coordinated with all foundations, structures, ground penetrations, etc. 	
<p>12. Paving Plans and Details updated:</p>	

<ul style="list-style-type: none"> a. Complete and final roadway and pavement dimensions to fully construct the facility including elements, such as: shoulder widths, taper lengths and widths, widening for guardrail, locations of concrete barrier, guardrail, impact attenuators, traffic islands, etc. b. Curb return profiles and details c. Tie in locations and details between new construction and existing 	
<p>13. Traffic Signal Plans and Details updated:</p> <ul style="list-style-type: none"> a. When Traffic Signal Plans are required for WSDOT owned infrastructure they are typically provided by either the Region Traffic Office or the HQ Traffic Office for incorporation into the project construction b. For traffic signals owned and operated by other local agencies, refer to their respective guidelines. 	
<p>14. Signing and Markings Plans, Details, and Sizing updated:</p> <ul style="list-style-type: none"> a. Complete final signing and marking plans, notes, schedules b. Complete final location of signage and pavement markings c. Complete final mounting and foundation detailed design d. Signs coordinated with structures/walls and mounting or foundation details complete e. Sizing dimensions and details of non-standard signs and markings f. Power source identification and locations for illuminated signs g. Complete and final signing design for overhead sign bridges, cantilevers, and other structures h. Locations of overhead signs in relation to lanes i. Final sign removals and relocations j. Parking requirement and details finalized 	
<p>15. Traffic Control Plans updated:</p> <ul style="list-style-type: none"> a. Complete final proposed traffic control plans b. Particular consideration given to public safety, worker safety, and maintaining mobility for vehicles, bicyclists, and pedestrians (including pedestrians with disabilities) through or around a work zone c. Consideration given to typical traffic control Plans found in MUTCD, or other local jurisdiction standard plans d. Location, size, color, and spacing of all elements included e. Review and agreement of local jurisdictions documented 	
<p>16. Detour Plans updated:</p> <ul style="list-style-type: none"> a. Complete final detour routes and signing plans b. Final Illumination plans c. Location, size, color, and spacing of all elements included d. Review and agreement of local jurisdictions documented 	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	

2. Updated quantities provided to Project Manager for ICE completion.	
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EP-03 CHECKLIST: COMMUNICATIONS ACCESS CONTROL – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical needs)	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications space room sizes, multi-use poles, conduit coordination, guideway element coordination)	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Network media limitations and proposed end device locations.	
4. Interdisciplinary coordination initiated and included:	
5. Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of access control panels and other end devices, and electrical power supply.	
6. Sequence of operations.	
7. Location of key equipment Access Card Readers and Access Control Panels(TVMs, SCRs, Access Control, TIDs, VMS, Phones, ..)	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	
3. Cutsheets of systems or devices that design is proposed to be based on.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. Proposed final drawing list with titles and drawing numbers.	
3. Keyplans and general arrangement plans shown with labels and sectors identified	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Communication block diagrams are provided for Access Control System.	
6. Communications rooms, cabinets, and bungalows shown on plans.	
7. Riser drawings are provided for Access Control System.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: COMMUNICATIONS ACCESS CONTROL– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state.	
2. Design deviations or design exceptions have been identified and submitted.	
3. Technical memoranda have been drafted.	
4. Known letters of concurrence drafted or completed. List below and status.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Service load calculations have been provided (electrical and UPS loads). Verify meeting service requirements.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Verify maintainability clearances.	
4. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
5. Responded to and addressed all issues identified in previous Constructability Reviews.	
6. Equipment designed included in Clash Detection models.	
7. Support of development of circulation diagrams of all equipment and verification of maintainability clearances.	

8. Participate in and resolve issues identified in Gap Analysis of BIM models.	
9. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply. Also coordination of room and cabinets sizing.	
3. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies). Working clearances sufficient for all maintenance and other future activities. Structural: Coordinate with structural discipline and all disciplines on location of conduits (e.g. penetrations) or mounting locations of comm devices (e.g. Access Control Panels). Coordinate seismic requirements. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
4. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. c. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. d. Participate in Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	

2. Requests for modification of the ST Standard Specifications submitted.	
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List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Key plans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table. Include speakers, Access Control Panel.	
4. Communication block diagrams are provided for Access Control System.	
5. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
6. One line drawings are provided for all systems.	
7. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
9. Preliminary wire notes, and wire and conduit schedule is provided.	
10. Network equipment schedule and VLANs are shown for all networked assets.	
11. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans	
12. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
13. Riser diagrams are provided for Access Control System.	
14. Construction notes on layout sheets are provided.	
15. Standard and special detail drawings and specifications are provided.	
16. Fiber optic communications schematics and single line diagram with fiber count shown.	
17. Temporary communications plan provided	
18. Power service locations, and panel service details provided	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
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1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03: CHECKLIST: COMMUNICATIONS ACCESS CONTROL– FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
4. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.)	
5. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	
6. Known Letters of Concurrence drafted or completed. List below and state status.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Loss calculations (e.g. fiber optic, radio signal) have been finalized.	
3. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
4. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) and transformers have been finalized.	
5. Power budget calculations (UPS, PoE, Power panels,)	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	

<p>2. Interdisciplinary coordination complete including: Communications review of non-communication specifications, with attention paid to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, cable hangers, securing couplers inside junction boxes, and concrete anchors, etc. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical and architectural package (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Structural: Communication equipment mounting and conduit details (e.g. penetrations) have been finalized and detailed with structural discipline. Updated specification references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).</p>	
<p>3. Completed tasks from the Project Integration and Implementation Plan:</p> <ol style="list-style-type: none"> a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model. 	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	

2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table.	
4. Communication block diagrams are provided for Access Control Systems.	
5. Schematic drawings showing connection details are provided for all devices.	
6. Mounting details for all communication assets are shown.	
7. One line drawings are provided for all systems.	
8. Final details shown and dimensioned.	
9. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
10. Finalized wiring and conduit schedule is provided.	
11. Finalized network equipment schedule and VLANs are shown for all networked assets.	
12. Equipment schedule is provided encompassing all communication assets.	
13. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
14. Riser diagrams are provided for Access Control System.	
15. Construction notes on layout sheets are provided.	
16. Standard and special detail drawings and specifications are provided.	
17. Cabinet layout drawings are provided for all systems.	
18. Temporary communications plan provided.	
19. Power service locations, and panel service details provided.	
20. Transformer / breaker schedule provided.	
21. I/O Schedules and description of operations.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03: CHECKLIST: COMMUNICATIONS CCTV – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: <ul style="list-style-type: none"> a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist 	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical, and network needs).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications space room sizes, multi-use poles, conduit coordination, guideway element coordination).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that require coordination in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Preliminary Interface Block Diagrams with Concept of Operations outlined. b. Identify equipment requiring remote monitoring. c. Preliminary design schematics and Sequence of Operations in construction documents. d. Coordinate on resolving ICDs (Interface Control Documents). Open ICD's to be listed below. 	
3. Identify areas of CCTV coverage (field-of-view).	
4. Network media limitations and proposed end device locations.	
5. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply.	
6. Location of CCTV key equipment	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started per the Design Technology Manual are complete. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
2. Preliminary drawing list with titles and drawing numbers.	
3. Keyplans and general arrangement plans shown with labels and sectors identified.	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Communication block diagrams.	
6. Sequence of Operation and system interface drawings identifying normal operation and emergency operation. Interfaces with control systems to be coordinated and shown.	

7. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	
8. List incorporation of ST Guidance Drawings below.	
9. Communications rooms, cabinets, and bungalows shown on plans.	
10. Riser drawings for CCTV system.	
11. Network topology (all network media type).	
12. Fiber one line.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: COMMUNICATIONS CCTV– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state.	
2. Design deviations or design exceptions have been identified and submitted.	
3. Technical memoranda have been drafted.	
4. Known letters of concurrence drafted or completed. List below and status.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Loss calculations (e.g. fiber optic) have been performed.	
2. Identify any copper runs estimated to be near or over media distance limitations.	
3. Service load calculations have been provided (electrical and UPS loads). Verify meeting service requirements.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing	
3. Verify maintainability clearances.	
4. Responded to and addressed all issues identified in previous Constructability Reviews.	
5. Equipment designed included in Gap Analysis and Clash Detection of BIM models.	
6. Support of development of circulation diagrams of all equipment and verification of maintainability clearances.	
7. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply. Also coordination of room and cabinets sizing.	
3. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies). Working clearances sufficient for all maintenance and other future activities. Structural: Coordinate with structural discipline and all disciplines on location of conduits (e.g. penetrations) or mounting locations of comm devices (e.g. VMS, CCTV,). Coordinate seismic requirements. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
4. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. b. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. c. Participate in Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table. Include speakers, VMS signs, other communications devices, and CCTV.	
4. Communication block diagrams are provided for all CCTV System.	
5. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
6. One line drawings are provided for all systems.	
7. Network topology.	
8. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
9. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
10. Preliminary wire notes, and wire and conduit schedule is provided.	
11. Network equipment schedule and VLANs are shown for all networked assets.	
12. Network typical for splicing backbone fiber.	
13. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans.	
14. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
15. Riser diagrams are provided for CCTV Systems.	
16. Camera field of view for detection, recognition, observation, and identification (all cameras).	
17. Construction notes on layout sheets are provided.	
18. Standard and special detail drawings and specifications are provided.	
19. Fiber optic communications schematics and single line diagram with fiber count shown.	
20. Temporary communications plan provided.	
21. Power service locations, and panel service details provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS CCTV – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
4. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.)	
5. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	
6. Known Letters of Concurrence drafted or completed. List below and state status.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Loss calculations (e.g. fiber optic, radio signal) have been finalized.	
3. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
4. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) and transformers have been finalized.	
5. Power budget calculations (UPS, PoE, Electrical panels).	
6. Coverage maps (field-of-view) have been finalized. Finalize all copper media distance limitation issues.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	

<p>2. Interdisciplinary coordination complete including: Communications review of non-communication specifications. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Includes direct power or PoE Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical and architectural package (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Structural: Communication equipment mounting and conduit details (e.g. penetrations) have been finalized and detailed with structural discipline. Updated specification references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).</p>	
<p>3. Completed tasks from the Project Integration and Implementation Plan:</p> <ul style="list-style-type: none"> c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model. 	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table.	
4. Communication block diagrams are provided for CCTV System.	
5. Schematic drawings showing connection details are provided for all devices.	
6. Mounting details for all communication assets are shown.	
7. One line drawings are provided for all systems.	

8. Final details shown and dimensioned.	
9. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
10. Finalized wiring and conduit schedule is provided.	
11. Finalized network equipment schedule and VLANs are shown for all networked assets.	
12. Equipment schedule is provided encompassing all communication assets.	
13. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
14. Riser diagrams are provided for CCTV System.	
15. Construction notes on layout sheets are provided.	
16. Standard and special detail drawings and specifications are provided.	
17. Cabinet layout drawings are provided for all systems.	
18. Temporary communications plan provided.	
19. Power service locations, and panel service details provided.	
20. Transformer / breaker schedule provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03: COMMUNICATIONS FARE VENDING – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist	
2. Technical memoranda, Letter of Concurrence, or Memoranda of Understanding, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding (MOU), if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Network, power, conduit and architectural coordination).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08	

2. Provide design information to support Constructability Reviews (Network, power, conduit and architectural coordination).	
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E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Preliminary Point to Point responsibility diagrams are complete. b. Preliminary Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Collaboration of TVM and SCR locations and require CCTV and lighting coverage.	
4. Coordination of power requirements with electrical and/or IT (for PoE).	
5. Network media limitations and proposed end device locations.	
6. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply.	
7. Location of key equipment (TVMs, SCRs, Network equipment).	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	

General notes identify applicable design codes and criteria, construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard. All drawings are per ST Design Technology Manual.	
3. Preliminary drawing list with titles and drawing numbers.	
4. Keyplans and general arrangement plans shown with labels and sectors identified.	
5. Electrical service location, type, and size shown in plans and summary table.	
6. Communication block diagrams are provided for all fare systems.	
7. Network equipment and TVM/SCR locations shown on plans.	
8. Riser drawings for fare vending systems are provided.	
9. System/Network topology (all network media types).	
10. Fiber one line (if applicable).	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: COMMUNICATIONS FARE VENDING– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a final state.	
2. Design deviations or design exceptions have been identified and submitted.	
3. Technical memoranda have been drafted.	
4. Known letters of concurrence or memoranda of understanding have been drafted or completed. List below and status.	
5. Usability, Accessibility and Maintainability report.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding, if any:

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C. Calculations:

ACTION	Y/N
1. Data storage, processing, hardware, and space required for fare system headend servers. Redundancy and failover justification. If system hardware is already existing, provide justification if additional processing, hardware, or redundancy is required.	
2. User Licenses required.	
3. Field systems redundancy justification. (if applicable, required redundancy of field devices).	
4. Coverage maps (e.g. network) have been developed. Identify any copper runs estimated to be near or over media distance limitations to TVMs/SCRs. See Network Checklist.	
5. Service load calculations have been provided (electrical and UPS loads). Verify meeting service requirements. PoE requirements.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Respond to and address all issues identified in previous Constructability Reviews.	
3. Complies with RFP requirements including ST approved construction sequencing.	
4. Support of development of circulation diagrams of all equipment and verification of usability and maintainability clearances. Started review with ST SMEs and operations.	
5. Equipment designed included in Gap Analysis and Clash Detection models of BIM models and identified issues being addressed. Include maintainer and user accessibility.	
6. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Finalize Point to Point responsibility diagrams. b. Finalize Interface Block Diagrams at a pre-final status with Concept of Operations outlined. c. Finalize development of Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. d. Finalize ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Finalize Gap Analysis using BIM model. Reviewed for maintainability. 	
3. Finalize Interdisciplinary coordination and include: Coordination with architects, electrical, network, and other disciplines, particularly for anticipated construction sequence and location/size of equipment (all fare vending equipment, TVM, SCRs, servers), conduits, mounting of end devices, and electrical power supply (normal and PoE).	
4. Finalize network media limitations and proposed end device locations.	
5. Finalize sequence of operations server redundancy.	
6. Finalize collaboration of TVM and SCR locations, architectural design, network design, power, signage, lighting, conduit design, and required CCTV coverage.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications list finalized.	

2. Specifications developed, refined, and coordinated with the drawings.	
3. Specifications developed and coordinated with drawings. Standard Specifications included. Cross referencing started.	
4. For Design Build, add requirement for design submittals to meet intent for 100% design requirements (see 90/100% checklist).	
5. Finalize ST Standard Specification modifications.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been finalized. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria, construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard. All drawings are per ST Design Technology Manual.	
3. Finalized drawing list with titles and drawing numbers.	
4. Finalized list incorporation of ST Guidance and Standard Drawings below	
5. Keyplans and general arrangement plans shown with labels and sectors identified	
6. Electrical service location, type, and size shown in plans and summary table for associated elements supporting fare vending systems.	
7. Communication block diagrams are provided for all systems. Typical connections from end device to headend for TVMs and SCRs.	
8. Sequence of Operation and system interface drawings identifying normal, emergency, and failover operation. Interfaces with all other systems to be coordinated and shown.	
9. Network equipment, TVM, and SCR locations shown on location plans.	
10. Finalize riser drawings for fare vending systems are provided. Locations specific connections to all devices back to network.	
11. System/Network topology (all network media types).	
12. Fiber one line (if applicable).	
13. Mounting details for TVMs and SCRs are shown and dimensioned, including pathway strategy.	
14. Preliminary details shown and dimensioned.	
15. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
16. Preliminary wire notes, and wire and conduit schedule is provided.	
17. Network equipment schedule and VLANs are shown for all networked devices.	
18. Equipment schedule is provided encompassing all fare vending equipment and locations.	
19. Drawings are coordinated with the specifications: Terminology is consistent between the two documents	

20. Specified materials and products are consistent between the two documents	
21. Construction notes on layout sheets are provided.	
22. Standard and special detail drawings and specifications are provided.	
23. Temporary communications plan provided if needed.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS FARE VENDING– FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding have been submitted, reviewed, and approved. List below.	
2. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
3. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.)	
4. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
3. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) and transformers have been finalized.	
4. Power budget calculations (UPS, PoE, Power panels).	
5. Coverage maps (verify TVM and SCR coverage).	
6. Finalize all copper media distance limitation issues.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	
2. Interdisciplinary coordination complete including: Communications review of non-communication specifications. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Includes direct power or PoE Architectural: Location of communications infrastructure (e.g. conduit and fare vending devices) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities.	
3. Completed tasks from the Project Integration and Implementation Plan: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	
4. Coordinated specifications are cross referenced.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are complete. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria, construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table for associated elements supporting fare vending systems.	
4. Communication block diagrams are provided for all systems.	
5. Schematic drawings showing connection details are provided for all devices.	
6. Mounting details for all fare vending devices are shown.	

7. Final details shown and dimensioned.	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
9. Finalized wiring and conduit schedule is provided.	
10. Finalized network equipment schedule and VLANs are shown for all networked assets.	
11. Equipment schedule is provided encompassing all fare vending equipment and locations.	
12. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
13. Riser diagrams are provided for all fare vending systems.	
14. Construction notes on layout sheets are provided.	
15. Standard and special detail drawings and specifications are provided.	
16. Temporary communications plan provided if needed.	
17. Cabinet layout drawings if required for new servers.	
18. Description of operations if required (failover scenarios).	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS NETWORKS– PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Third party network interfacing requirements (include interagency network or data sharing requirements)	
2. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understand (MOU), if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications bandwidth estimates and mechanical/electrical needs).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications space room sizes and equipment maintainability, conduit coordination, guideway element coordination, end devices monitored, control system design issues, and any required sequencing for construction.)	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Network media limitations and proposed end device locations.	
4. Interdisciplinary coordination initiated and included: Coordination with architects, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply (UPS).	
5. Sequence of construction if temporary networks are required.	

Description of interdisciplinary coordination efforts:

List of ICDs and other interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Legend of Symbols and Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
3. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	
4. All drawings are per Design Technology Manual.	
5. Preliminary drawing list with titles and drawing numbers.	
6. Keyplans and general arrangement plans shown with labels and sectors identified.	
7. Electrical service location, type, and size shown in plans and summary table.	
8. Communication block diagrams.	
9. Communications rooms, cabinets, and bungalows shown on plans.	
10. Location of all devices connecting to TCN and EFN Network equipment. Rooms, cabinets, and bungalows shown with space allocations for hardware/cabinets/racks shown on plans.	
11. Riser drawings.	
12. Network topology (all network media types).	
13. Fiber one line.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: COMMUNICATIONS NETWORKS– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state and approved.	
2. Design deviations or design exceptions have been identified and submitted. List below and provide status.	
3. Technical memoranda have been drafted. List below and provide status.	
4. Known letters of concurrence drafted or completed. List below and status.	
5. Usability, Accessibility and Maintainability report.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding, if any:

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C. Calculations:

ACTION	Y/N
1. Loss calculations (e.g. fiber optic) have been performed.	
2. Identify any copper runs estimated to be near or over media distance limitations.	
3. Service load calculations have been provided (electrical and UPS loads). Verify meeting service requirements.	
4. PoE power budget assuming all PoE ports are enabled.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	

2. Complies with RFP requirements including ST approved construction sequencing. Especially related to temporary networks and early openings.	
3. Verify maintainability clearances.	
4. Support of development of circulation diagrams of all equipment and verification of maintainability clearances. Started review with ST SMEs and operations.	
5. Responded to and addressed all issues identified in previous Constructability Reviews.	
6. Equipment designed included in Clash Detection models.	
7. Participate in and resolve issues identified in Gap Analysis of BIM models.	
8. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Interdisciplinary coordination initiated and included: Coordination with architects, electrical, mechanical and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply. Also coordinate on room and cabinets sizing.	
3. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies). Working clearances sufficient for all maintenance and other future activities. Controls: Coordination with control systems networks	
4. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Finalize Point to Point responsibility diagrams. b. Finalize Interface Block Diagrams with Concept of Operations outlined. c. Finalize ICDs (Interface Control Documents). ICD's to be listed below with status with resolution status. d. Finalize maintainability of equipment (circulation diagrams, working clearances, maintainer accessibility for all hardware and cabinets, proper separation of system hardware/power for ST working groups/procedures.) e. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. f. Participate in Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

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List ICDs and other interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	
3. Finalize ST Standard Specification modifications.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Legend of Symbols, Abbreviations, General Notes, and Typical Details have been started. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard and drawings completed per ST Design Technology Manual.	
3. Finalized drawing list with titles and drawing numbers.	
4. List incorporated standard or guidance drawings below.	
5. Keyplans and general arrangement plans shown with labels and sectors identified	
6. Electrical service location, type, and size shown in plans and summary table. Include communications devices/cabinets.	
7. Communications block, riser, and network diagrams finalized to show complete system design topology/network, hardware, integration elements, locations and system features.	
8. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
9. Network topology and fiber cabling one line.	
10. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
11. Proposed conduits routing, location, size (via fill ratios), and labeled in plans, details, and schedule.	
12. Preliminary wire notes, and wire and conduit schedule is provided.	
13. Network equipment schedule and VLANs are shown for all networked assets.	
14. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans.	
15. Drawings are coordinated with the specifications:	

Terminology is consistent between the two documents Specified materials and products are consistent between the two documents.	
16. Rack/cabinet elevation details.	
17. Construction and required sequencing notes on layout sheets are provided.	
18. Standard and special detail drawings and specifications are provided.	
19. Fiber optic communications schematics and single line diagram with fiber count shown.	
20. Temporary communications plan provided.	
21. Power service locations, and panel service details provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS NETWORKS – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
4. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.)	
5. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	

List all approved Requests for Deviation, including approval status, if any:

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List Technical memoranda and approval status, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding and approval status, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Loss calculations (e.g. fiber optic) have been finalized.	
3. Sizing for conduits, raceway, innerduct, pull boxes, manholes have been finalized.	
4. Electrical power budget calculations (UPS, Power panels).	
5. PoE power budget finalized assuming all PoE ports are enabled.	
6. Coverage maps (e.g. CCTV, radio, network, PA) have been finalized. Finalize all copper media distance limitation issues.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	

2. Incorporated agreed upon analysis (value, safety, or security analysis).	
3. Temporary networks and early opening sequencing and coordination finalized.	
4. Finalize equipment circulation diagrams and maintainability clearances.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	
2. Interdisciplinary coordination complete including: Communications review of non-communication specifications. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Includes both direct power or PoE Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical to ensure adequate environmental conditions are provided for communications equipment (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Controls: Coordination with control systems networks	
3. Completed tasks from the Project Integration and Implementation Plan: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

List ICDs and other interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	
4. Coordination and cross referencing of network relation specifications and related discipline specifications (electrical, mechanical, and supported systems).	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Legend of Symbols, Abbreviations, General Notes, and Typical Details have been started. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard and drawings completed per ST Design Technology Manual	
3. List incorporated standard or guidance drawings below.	
4. Keyplans and general arrangement plans shown with labels and sectors identified	
5. Electrical service location, type, and size shown in plans and summary table.	
6. Communications block, riser, and network diagrams finalized to show complete system design topology/network, hardware, integration elements, locations and system features.	
7. Schematic drawings showing connection details are provided for all devices.	
8. Mounting details for all communication assets are shown.	
9. Network topology and fiber cabling one line.	
10. Network typical for splicing backbone fiber.	
11. Fiber splicing diagram and schedules.	
12. Fiber patching details and schedules.	
13. Network panel/rack layouts.	
14. Final equipment details shown and dimensioned.	
15. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
16. Finalized wiring and conduit schedule is provided.	
17. Finalized network equipment schedule and VLANs are shown for all networked assets.	
18. Equipment schedule is provided encompassing all communication assets.	
19. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
20. Construction notes on layout sheets are provided.	
21. Rack and Cabinet layout drawings are provided for fiber and copper cabling systems..	
22. Temporary communications plan provided.	
23. Power service locations, and panel service details provided	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS PA/VMS – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist i) Third party interfacing requirements with signaling, train control, traction power, comm systems, mechanical, electrical, plumbing, and fire life/safety systems.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical needs).	
2. Audio System Model.	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications space room sizes, conduit coordination, , coordination with Architectural design.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Network media limitations and proposed end device locations.	
4. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/sof communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply.	
5. Sequence of operations.	
6. Location of key equipment (VMS, Speakers,..).	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	
3. Cutsheets of systems or devices that design is proposed to be based on.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. Proposed final drawing list with titles and drawing numbers.	
3. Keyplans and general arrangement plans shown with labels and sectors identified	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Communication schematic diagrams are provided for all systems.	
6. Communications rooms, cabinets, and bungalows shown on plans.	
7. Location Plans identifying audio zones.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable.	

EP-03 CHECKLIST: COMMUNICATIONS PA/VMS– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state and approved.	
2. Design deviations or design exceptions have been identified and submitted. List below and provide status.	
3. Technical memoranda have been drafted. List below and provide status.	
4. Known letters of concurrence drafted or completed. List below and status.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Coverage maps (PA, VMS) have been developed. Identify any copper runs estimated to be near or over media distance limitation.	
2. Service load calculations have been provided, (electrical and UPS loads). Verify meeting service requirements.	
3. Determine brightness settings for VMS signs at each application. Consider lighting (natural light, glare, (other??)).	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

3. Responded to and addressed all issues identified in previous Constructability Reviews.	
4. Equipment designed included in Clash Detection models.	
5. Support of development of circulation diagrams of all equipment and verification of maintainability clearances.	
6. Participate in and resolve issues identified in Gap Analysis of BIM models. Visibility of VMS signs from key locations within BIM model.	
7. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply.	
3. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies). Working clearances sufficient for all maintenance and other future activities. Structural: Coordinate with structural discipline and all disciplines on location of conduits (e.g. penetrations) or mounting locations of comm devices (e.g. VMS, CCTV). Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
4. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Support development of Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Participate in Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	
3. Specify Audio Requirements consider code requirements and noise ordinance limitations.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table. Include speakers, VMS signs, other communications devices, and CCTV.	
4. Communication block diagrams are provided for all systems.	
5. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
6. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
7. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
8. Preliminary wire notes, and wire and conduit schedule is provided.	
9. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans.	
10. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
11. Riser diagrams are provided for all systems.	
12. Construction notes on layout sheets are provided.	
13. Standard and special detail drawings and specifications are provided.	
14. Power service locations, and panel service details provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS PA/VMS – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
4. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations).	
5. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
3. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type and length) and transformers have been finalized.	
4. Power budget calculations (UPS, PoE, Power panels).	
5. Coverage maps (e.g. CCTV, , network, PA/VMS have been finalized. Finalize all copper media distance limitation issues.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N

1. Critical interdisciplinary issues resolved and complete.	
2. Interdisciplinary coordination complete including: Communications review of non-communication specifications. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Includes both direct power or PoE Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical to ensure adequate environmental conditions are provided for communications equipment (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Controls: Coordination with control systems networks	
3. Completed tasks from the Project Integration and Implementation Plan: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	
4. Commissioning and testing are complete and clear.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table.	
4. Communication block diagrams are provided for all systems.	
5. Schematic drawings showing connection details are provided for all devices.	

6. Mounting details for all communication assets are shown.	
7. One line drawings are provided for all systems.	
8. Network panel/rack layouts.	
9. Final details shown and dimensioned.	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
11. Finalized wiring and conduit schedule is provided.	
9. Finalized network equipment schedule and VLANs are shown for all networked assets.	
10. Equipment schedule is provided encompassing all communication assets.	
11. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
12. Riser diagrams are provided.	
13. Construction notes on layout sheets are provided.	
14. Standard and special detail drawings and specifications are provided.	
15. Cabinet layout drawings are provided for all systems.	
16. Power service locations, and panel service details provided.	
17. Transformer / breaker schedule provided.	
18. I/O Schedules and description of operations.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS PHONES– PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist	
2. Technical memoranda, Letter of Concurrence, or Memoranda of Understanding, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding (MOU), if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Network, power, conduit, and architectural coordination).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08.	

2. Provide design information to support Constructability Reviews (Network, power, conduit, and architectural coordination).	
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E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Preliminary Point to Point responsibility diagrams are complete. b. Preliminary Interface Block Diagrams drafted with Concept of Operations outlined. Identify end users to identify coordination of configuration and system devices to be configured (phones/servers/network). Include failure modes. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of equipment (phone and servers), conduits, mounting of end devices, and electrical power supply.	
4. Network media limitations and proposed end device locations.	
5. Sequence of operations call redundancy or server redundancy.	
6. Collaboration of phone locations, architectural design, network design, power, signage, lighting, conduit design, and required CCTV coverage.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	

General notes identify applicable design codes and criteria, construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard. All drawings are per ST Design Technology Manual.	
3. Preliminary drawing list with titles and drawing numbers.	
4. List incorporation of ST Standard and Guidance Drawings below.	
5. Keyplans and general arrangement plans shown with labels and sectors identified	
6. Electrical service location, type, and size shown in plans and summary table.	
7. Communication block diagrams. Typical connections from end device to headend for each phone type.	
8. Sequence of Operation and system interface drawings identifying normal, emergency, and failover operation. Interfaces with all other systems to be coordinated and shown.	
9. Network equipment and phone locations shown on location plans.	
10. Riser drawings for each phone system are provided. Locations specific connections to all devices back to network.	
11. System/Network topology (all network media types)	
12. Fiber one line (if applicable).	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: COMMUNICATIONS PHONES– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a final state.	
2. Design deviations or design exceptions have been identified and submitted. List below and status.	
3. Technical memoranda have been finalized. List below and status.	
4. Known letters of concurrence or memoranda of understanding have been drafted or completed. List below and status.	
5. Usability, Accessibility and Maintainability report.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding, if any:

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C. Calculations:

ACTION	Y/N
1. Data storage, processing, hardware, and space required for phone system headend call servers or application servers. Redundancy and failover justification. If system hardware is already existing, provide justification if additional processing, hardware, or redundancy is required.	
2. User Licenses required.	
3. Field systems redundancy justification. (if applicable, example tunnel ETEL/PET have local call server).	
4. Coverage maps (e.g. network) have been developed. Identify any network media runs estimated to be near or over media distance limitations to support phones (250ft for CAT cables). See Network Checklist, only provide if not already covered in network checklist.	
5. Service load calculations have been provided (electrical and UPS loads). Verify meeting service requirements. PoE requirements. See Network Checklist.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews resolutions.	
2. Respond to and address all issues identified in previous Constructability Reviews.	
3. Complies with RFP requirements including ST approved construction sequencing.	
4. Support of development of circulation diagrams of all equipment and verification of usability and maintainability clearances. Started review with ST SMEs and operations.	
5. Equipment designed included in Gap Analysis and Clash Detection models of BIM models and identified issues being addressed. Include maintainer and user accessibility.	
6. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Finalize Point to Point responsibility diagrams. b. Finalize Interface Block Diagrams drafted with Concept of Operations outlined. Identify end users to identify coordination of configuration and system devices to be configured (phones/servers/network). Include failure modes. c. Finalize ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. d. Finalize Gap and Clash Analysis using BIM model. Reviewed for maintainability. 	
3. Finalize Interdisciplinary coordination and include: Coordination with architects, electrical, network, and other disciplines, particularly for anticipated construction sequence and location/size of equipment (phones and servers), conduits, mounting of end devices, and electrical power supply (normal and PoE).	
4. Finalize network media limitations and proposed end device locations.	
5. Finalize sequence of operations call redundancy or server redundancy.	
6. Finalize collaboration of phone locations, architectural design, network design, power, signage, lighting, conduit design, and required CCTV coverage.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications list finalized.	
2. Specifications developed, refined, and coordinated with the drawings.	
3. Specifications developed and coordinated with drawings. Standard Specifications included. Cross referencing started.	
4. For Design Build, add requirement for design submittals to meet intent for 100% design requirements (see 90/100% checklist).	
5. Finalize ST Standard Specification modifications.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are finalized. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria, construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard. All drawings are per ST Design Technology Manual.	
3. Finalized drawing list with titles and drawing numbers.	
4. Finalized list incorporation of ST Standard and Guidance Drawings below	
5. Keyplans and general arrangement plans shown with labels and sectors identified	
6. Electrical service location, type, and size shown in plans and summary table for associated elements supporting phone systems.	
7. Communication block diagrams are provided for each phone system. Typical connections from end device to headend for each phone type.	
8. Sequence of Operation and system interface drawings identifying normal, emergency, and failover operation. Interfaces with all other systems to be coordinated and shown.	
9. Network equipment and phone locations shown on location plans.	
10. Finalize riser drawings for each phone system are provided. Locations specific connections to all devices back to network.	
11. System/Network topology (all network media types).	
12. Fiber one line (if applicable).	
13. Mounting details for all phone types are shown and dimensioned, including pathway strategy.	
14. Preliminary details shown and dimensioned, including voice utility outlets.	
15. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
16. Preliminary wire notes, and wire and conduit schedule is provided.	
17. Network equipment schedule and VLANs are shown for all networked phones.	
18. Equipment schedule is provided encompassing all phones and locations.	
19. Drawings are coordinated with the specifications:	

Terminology is consistent between the two documents	
Specified materials and products are consistent between the two documents	
20. Construction notes on layout sheets are provided.	
21. Standard and special detail drawings and specifications are provided.	
22. Temporary communications plan provided if needed for early phone service.	

Provide notes on the implementation of ST Standard and Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS PHONES – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding have been submitted, reviewed, and approved. List below.	
2. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
3. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.). If required for phones.	
4. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
3. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) and transformers have been finalized.	
4. Power budget calculations (UPS, PoE, Power panels).	
5. Coverage maps (verify phone coverage for PET/ETEL/CES).	
6. Finalize all copper media distance limitation issues.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	
2. Interdisciplinary coordination complete including: Communications review of non-communication specifications. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Includes both direct power or PoE Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical to ensure adequate environmental conditions are provided for communications equipment (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities.	
3. Completed tasks from the Project Integration and Implementation Plan: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	
4. Coordinated specifications are cross referenced.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are complete. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria, construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	

2. Keyplans and general arrangement plans shown with labels and sectors identified.	
3. Electrical service location, type, and size shown in plans and summary table for associated elements supporting phone systems.	
4. Communication block diagrams are provided for all phone systems.	
5. Schematic drawings showing connection details are provided for all devices.	
6. Mounting details for all phone types are shown.	
7. Final details shown and dimensioned.	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
9. Finalized wiring and conduit schedule is provided.	
10. Finalized network equipment schedule and VLANs are shown for all networked phones.	
11. Equipment schedule is provided encompassing all phones and locations.	
12. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
13. Riser diagrams are provided for all phones systems.	
14. Construction notes on layout sheets are provided.	
15. Standard and special detail drawings and specifications are provided.	
16. Cabinet layout drawings if required for new call servers..	
17. Temporary communications plan provided if needed for early phone service.	
18. Description of operations if required (failover scenarios).	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS RADIO – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions b. PSERN b. NPSBN c) Assumptions d) Conceptual DAS design e) Strategy for providing maintainability f) Strategy for addressing redundancy g) Code compliance and identification of areas of concern h) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments i) Sustainability scope of work identified by the sustainability checklist	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical needs).	
2. DAS Design Block Diagram for the facility (ies) (no calculations yet).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications	

space room sizes, multi-use poles, conduit coordination, guideway element coordination).	
2. Planned submittal schedule to ST and FCC licensees.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Fiber Optical needs for the design.	
4. Network ports and protocol support needed at each facility.	
5. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply.	
6. Sequence of operations.	
7. Location of key equipment (Headend, BBU and RRU).	
8. Coordination plan with FCC Licensees.	

Description of interdisciplinary coordination efforts:

1. FACP and BMS ICD coordination.

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	
3. Cutsheets of systems or devices that design is proposed to be based on.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. Proposed final drawing list with titles and drawing numbers.	
3. Key plans and general arrangement plans shown with labels and sectors identified.	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Communication block diagrams are provided for all systems.	
6. Communications rooms, cabinets, and bungalows shown on plans.	

7. Riser DAS drawings.	
8. Network topology and fiber cabling one line.	
9. Circulation around cabinets (spacing only).	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable.	

EP-03 CHECKLIST: COMMUNICATIONS RADIO– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state.	
2. Design deviations or design exceptions have been identified and submitted.	
3. Technical memoranda have been drafted.	
4. Known letters of concurrence drafted or completed. List below and status.	
5. DAS Intermediate Design.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Propagation, Signal and Noise calculations at donor sites.	
2. Preliminary DAS design to be submitted to FCC Licensees.	
3. Loss calculations (e.g. fiber optic, radio signal) have been performed.	
4. DAS Coverage maps.	
5. Service load calculations have been provided (electrical and UPS loads). Verify meeting service requirements.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Verify grounding and lighting protection per NFPA 780 & R56.	
4. Verify maintainability clearances.	

5. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
6. Responded to and addressed all issues identified in previous Constructability Reviews.	
7. Equipment designed included in Clash Detection models.	
8. Support of development of circulation diagrams of all equipment and verification of maintainability clearances.	
9. Participate in and resolve issues identified in Gap Analysis of BIM models.	
10. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Coordination and response to FCC Licensee concerns.	
3. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply. Also coordination of room and cabinets sizing.	
4. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies and antenna location). Working clearances sufficient for all maintenance and other future activities. Structural: Coordinate with structural discipline and all disciplines on location of conduits (e.g. penetrations) or mounting locations of comm devices (e.g. VMS, CCTV, donor and distribution antennas). Coordinate seismic requirements. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
5. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Support development of Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Participate in Gap Analysis using BIM model.	

f. Obtain ST approval of coverage maps	
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Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Key plans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table. Include donor and distribution antennas, junction boxes and cable pathways.	
4. Communication block diagrams are provided for all systems.	
5. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
6. One-line drawings are provided for all systems.	
7. Network topology and fiber cabling one line.	
8. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
9. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
10. Preliminary wire notes, and wire and conduit schedule are provided.	
11. Network equipment schedule, IP Addressing and VLANs are shown for all networked assets.	
12. Network typical for splicing backbone fiber.	
13. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans.	
14. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
15. Riser diagrams are provided for all systems.	

16. Construction notes on layout sheets are provided.	
17. Standard and special detail drawings and specifications are provided.	
18. Fiber optic communications schematics and single line diagram with fiber count shown.	
19. Temporary communications plan provided.	
20. Power service locations, and panel service details provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS RADIO – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
4. Coverage Acceptance Test Plan (CATP) for all DAS covered areas, platforms and ROW approved by ST.	
5. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	
6. Known Letters of Concurrence from FCC Licensees and AHJ drafted. List below and state status.	
7. Final Design Review.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Coverage maps have been finalized. Finalize all copper media distance limitation issues.	
3. Loss calculations (e.g. fiber optic, radio signal) have been finalized.	
4. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
5. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) have been finalized.	
6. Power budget calculations (UPS, PoE, Power panels).	
7. UL & DL power and noise calculations at donor sites.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	
2. Incorporated agreed upon analysis (value, safety, or security analysis)	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	
2. Interdisciplinary coordination complete including: Communications review of non-communication specifications, with attention paid to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, cable hangers, securing couplers inside junction boxes, and concrete anchors, etc. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical and architectural package (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Structural: Communication equipment mounting and conduit details (e.g. penetrations) have been finalized and detailed with structural discipline. Updated specification references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
3. Completed tasks from the Project Integration and Implementation Plan: <ul style="list-style-type: none"> a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model. 	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N

1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
3. Key plans and general arrangement plans shown with labels and sectors identified	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Communication block diagrams are provided for all systems.	
6. Schematic drawings showing connection details are provided for all devices.	
7. Mounting details for all communication assets are shown.	
8. One-line drawings are provided for all systems.	
9. Network topology and fiber cabling one line.	
10. Network typical for splicing backbone fiber.	
11. Fiber splicing diagram and schedules.	
12. Fiber patching details and schedules.	
13. Network panel/rack layouts.	
14. Final details shown and dimensioned.	
15. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
16. Finalized wiring and conduit schedule is provided.	
17. Finalized network equipment schedule and VLANs are shown for all networked assets.	
18. Equipment schedule is provided encompassing all communication assets.	
19. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
20. Riser diagrams are provided.	
21. Construction notes on layout sheets are provided.	
22. Standard and special detail drawings and specifications are provided.	
23. Cabinet layout drawings are provided for all systems.	
24. Temporary communications plan provided.	
25. Power service locations, and panel service details provided.	
26. Transformer / breaker schedule provided.	
27. I/O Schedules and description of operations.	
28. CATP Tile drawings, approved by ST and AHJ.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS SCADA – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist i) Third party interfacing requirements with signaling, train control, traction power, comm systems, mechanical, electrical, plumbing, and fire life/safety systems.	
2. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understand (MOU), if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical, and network needs).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications space room sizes, enclosures, conduit coordination, guideway element coordination, end devices monitored, control system design issues, and any required sequencing for construction).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues raised in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Preliminary Point to Point responsibility diagrams. b. Preliminary Interface Block Diagrams drafted with Concept of Operations outlined. c. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. d. Show maintainability of equipment (circulation diagrams, working clearances, maintainer accessibility for all hardware and cabinets, proper separation of system hardware/power for ST working groups/procedures.) 	
3. Network media limitations and preliminary end device locations for processors and remote I/O.	
4. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, fire life/safety, systems and other disciplines and systems (TCS, BMS, and EVS), particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply (UPS).	
5. Coordination of control system design. Define equipment being monitored, location of processors and remote I/O, HMI/workstation locations, server locations, typical inputs/outputs, what data is shared with SCADA headend, and Sequence of operations for all I/O requiring PLC logic. UPS power and cooling/ventilation requirements.	

List of ICDs and other interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	
3. Cutsheets of systems or devices that design is proposed to be based on.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Legend of Symbols and Abbreviations, General Notes, and Typical Details have been started.	
2. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
3. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	
4. All drawings are per Design Technology Manual.	
5. Preliminary drawing list with titles and drawing numbers.	
6. List incorporated standard or guidance drawings below.	
7. Key plans and general arrangement plans shown with labels and sectors identified	
8. Electrical service location, type, and size shown in plans and summary table.	
9. Communication block diagrams.	
10. Sequence of operations and system interface drawings identifying normal and emergency operation and alarming. End devices interfacing with control systems to be coordinated and shown (I/O required, hardwired and network interfacing).	
11. Location of all devices reporting to SCADA and control system hardware (PLC, RIO, HMI, workstation). Rooms, cabinets, and bungalows shown with space allocations for hardware/cabinets/racks shown on plans.	
12. Riser drawings.	
13. Network topology (all network media types).	
14. Fiber one line.	

List and provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable.	

EP-03 CHECKLIST: COMMUNICATIONS SCADA – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state and approved.	
2. Design deviations or design exceptions have been identified and submitted. List below and status.	
3. Technical memoranda have been finalized. List below and status.	
4. Known letters of concurrence or memoranda of understanding have been drafted or completed. List below and status.	
5. Provide graphics icons for ST approval.	
6. Usability, Accessibility and Maintainability report.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding, if any:

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C. Calculations:

ACTION	Y/N
1. Data storage, processing, hardware, and space required for SCADA Front End Processor, Application and Historian servers. Redundancy and failover justification. If system hardware is already existing, provide justification if additional processing, hardware, or storage is required or not.	
2. User Licenses required.	
3. Field processing and redundancy justification.	
4. Network media justified for connectivity.	
5. Heat load calcs for all rooms and cabinets housing designed hardware. Cooling and/or ventilation justified based on requirements of designed equipment.	
6. Electrical and UPS load calcs for control cabinets.	

7. Estimated media lengths for all network media required for SCADA/control system design and identify lengths close to media limits (250ft for CAT cables). Only need to include what is not covered in network checklist.	
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D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Respond to and address all issues identified in previous Constructability Reviews.	
3. Complies with RFP requirements including ST approved construction sequencing.	
4. Support of development of circulation diagrams of all equipment and verification of maintainability clearances. Started review with ST SMEs and operations.	
5. Equipment designed is included in Gap Analysis and Clash Detection of BIM models and identified issues being addressed. Include maintainer accessibility.	
6. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues resolved and complete (see 30% checklist).	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Finalize Point to Point responsibility diagrams. b. Finalize Interface Block Diagrams with Concept of Operations outlined. c. Finalize ICDs (Interface Control Documents). ICD's to be listed below with status with resolution status. d. Finalize maintainability of equipment (circulation diagrams, working clearances, maintainer accessibility for all hardware and cabinets, proper separation of system hardware/power for ST working groups/procedures.) 	
3. Network and location details finalized for control system design. Network meets ST IT topology standards.	
4. Interdisciplinary coordination finalized and included: <ul style="list-style-type: none"> a. Coordination with architects, structural, electrical, mechanical, fire life/safety, systems, and other disciplines and systems (TCS, BMS, and EVS), particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, room and cabinet cooling and ventilation required for installed hardware, and electrical power supply for all hardware (server racks, control panels, power supplies, and backup power requirements). 	
5. Coordination of control system design finalized. Define equipment being monitored, location of processors and remote I/O, HMI/workstation locations, server locations, Cabinet design and locations, maintainability of equipment in rooms and control cabinets, inputs/outputs, what data is shared with SCADA headend, and Sequence of operations for all I/O requiring PLC logic.	

List ICDs and other interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications list finalized.	
2. Update graphics icons as an appendix to the Specifications.	
3. Specifications developed and coordinated with drawings. Standard Specifications included. Cross referencing started.	
4. For Design Build, add requirement for design submittals to meet intent for 100% design requirements (see 90/100% checklist).	
5. Finalize ST Standard Specification modifications.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Legend of Symbols and Abbreviations, General Notes, and Typical Details are finalized. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard and drawings completed per ST Design Technology Manual.	
3. Finalized drawing list with titles and drawing numbers.	
4. List incorporated standard or guidance drawings below.	
5. Keyplans and general arrangement plans shown with labels and sectors.	
6. Electrical service location, type, and size shown in plans and summary table.	
7. Communications block, riser, and network diagrams finalized to show complete system design topology/network, hardware, integration elements, locations and system features.	
8. Provide System Architecture drawings showing how SCADA interfaces with other sub-systems, including connections to the Network, Servers, Workstations and Video Wall.	
9. Finalize Sequence of Operation and system interface drawings identifying normal operation and emergency operation and status/alarming. Interfaces with control systems to be coordinated and shown. I/O list finalized, for hardwired and networked I/O. Only typicals required for design build.	
10. Rack layouts showing all hardware required installation in racks and control cabinets. Only typicals required for design build.	
11. Rack/Cabinet grounding design.	
12. Typical I/O wiring by I/O type and field wiring.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable.	

EP-03 CHECKLIST: COMMUNICATIONS SCADA – FINAL DESIGN 90% and 100%

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Technical memoranda, Letters of Concurrence, or Memoranda of Understanding have been submitted, reviewed, and approved.	
2. Design deviations or design exceptions have been finalized and approved.	
3. Known letters of concurrence completed. List below and status.	
4. Final graphics icons.	
5. Final Usability, Accessibility and Maintainability report.	

List all Requests for Deviation including approval status:

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List Technical memoranda and approval status, if any:

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List Letters of Concurrence (LOC) or Memoranda of Understanding and approval status, if any:

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C. Calculations:

ACTION	Y/N
1. Finalized Data storage, processing, hardware, and space required for SCADA Front End Processor, Application and Historian servers. Redundancy and failover justification. If system hardware is already existing, provide justification if additional processing, hardware, or storage is required or not.	
2. Finalized User Licenses required.	
3. Finalized Field processing and redundancy justification.	
4. Finalized Network media justified for connectivity.	
5. Finalized Heat load calcs for all rooms and cabinets housing designed hardware. Cooling and/or ventilation justified based on requirements of designed equipment.	
6. Finalized Electrical load calcs for control cabinets.	
7. Finalized Estimated media lengths for all network media required for SCADA/control system design and identify lengths close to media limits (250ft for CAT cables). Only need to include what is not covered in network checklist.	

D. Constructability

ACTION	Y/N
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1. All constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08 are RESOLVED. Design incorporates Constructability Review issues resolutions.	
2. Complies with RFP requirements including ST approved construction sequencing.	
3. Circulation diagrams of all equipment and verification of maintainability clearances are complete and accepted by ST.	
4. All issues identified in Gap Analysis of BIM models are resolved.	
5. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. All interdisciplinary coordination issues resolved and complete.	
2. Project Integration Implementation Plan and support plan identified deliverables are accepted, and issues resolved.	
3. Network coordination complete and approved.	
4. Interdisciplinary coordination complete for all disciplines. Architecture, structural, electrical, mechanical, fire life/safety, systems, and other disciplines. Including all headend and field systems that feed into Train Control, Building Management Systems, and Emergency Ventilation Systems.	
5. Coordination of control system design is complete. Equipment monitored, I/O lists, Control system hardware (PLC, RIO, HMIs, workstations, servers) and network, programming requirements of PLCs, Cabinet design, UPS power design for hardware (headend, cabinets, and field), data requirements (local and headend), cooling/ventilation requirements and maintainability requirements .	

List ICDs:

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F. Specifications:

ACTION	Y/N
1. Specifications complete and coordinated with cross referencing to other related specifications sections and drawings.	
2. List all final modifications to ST Standard Specifications.	
3. Add level of detail requirements for detailed designs to be provided by the contractor in shop drawings and design reviews. Verified with ST on what is needed for maintainability of system.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
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1. Symbols, Abbreviations, General Notes are complete. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard and drawings completed per ST Design Technology Manual.	
3. Finalized drawing list with titles and drawing numbers.	
4. List incorporated standard or guidance drawings below.	
5. Key plans and general arrangement plans shown with labels and sectors finalized	
6. Electrical service location, type, and size shown in plans and summary table.	
7. Communications block, riser, and network diagrams finalized to show complete system design topology/network, hardware, integration elements, locations and system features.	
8. Final System Architecture drawing showing how SCADA interfaces with other sub-systems, including connections to the Network, Servers, Workstations and Video Wall.	
9. Finalized Sequence of Operation and system interface drawings identifying normal operation and emergency operation and status/alarming. Interfaces with control systems to be coordinated and shown. I/O list finalized, for hardwired and networked I/O.	
10. Detailed Rack layouts showing all hardware required installation in each rack and control cabinet. Cabinet/rack wiring details. Cabinet/rack installation details. .	
11. Rack/Cabinet grounding design.	
12. Typical I/O card wiring by I/O type and field wiring.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS TELECOMMUNICATIONS SPACES– PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical needs).	
2. Relationship between room sizes and area to be served at each floor.	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Telecommunications Space room sizes, conduit coordination, guideway element coordination,)	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Identify cabinet and distribution panel locations inside the spaces	
4. Identify circulation areas in each space.	
5. Identify Entrance Facility, conduit number and location.	
6. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply.	
7. Location of key equipment (TVMs, SCRs, BDA, antennas, Access Control, TIDs, VMS, Phones, ..)	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	
3. Door schedule and opening.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. Proposed final drawing list with titles and drawing numbers.	
3. Key plans and general arrangement with labels and sectors identified.	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Location of luminaries, panel boards and utility outlets.	
6. Communications rooms, cabinets, and bungalows shown on plans.	
7. Conduit riser drawings.	
8. Circulation diagrams for each space.	
9. Donor antenna location, grounding and lighting protection (typical is acceptable).	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: COMMUNICATIONS TELECOMMUNICATIONS SPACES – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state.	
2. Design deviations or design exceptions have been identified and submitted.	
3. Technical memoranda have been drafted.	
4. Known letters of concurrence drafted or completed. List below and status.	
5. HVAC & Power design completed.	
6. Conduit schedule completed.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. HVAC calculations for final load completed.	
2. Conduit schedule and filing calculations completed.	
3. Loss calculations (e.g. fiber optic, radio signal) have been performed.	
4. Final coverage maps approved by ST have been developed.	
5. Service load calculations have been provided (electrical and UPS final loads). Verify meeting service requirements.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Verify maintainability clearances.	

4. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
5. Responded to and addressed all issues identified in previous Constructability Reviews.	
6. Equipment designed included in Clash Detection models.	
7. Support of development of circulation diagrams of all equipment and verification of maintainability clearances.	
8. Participate in and resolve issues identified in Gap Analysis of BIM models.	
9. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply. Also coordination of room and cabinets sizing.	
3. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies). Working clearances sufficient for all maintenance and other future activities. Structural: Coordinate with structural discipline and all disciplines on location of conduits (e.g. penetrations) or mounting locations of comm devices (e.g. VMS, CCTV, Radio). Coordinate seismic requirements. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
4. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Support development of Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Participate in Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Key plans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table. Include speakers, VMS signs, other communications devices, and CCTV.	
4. Communication block diagrams are provided for all systems.	
5. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
6. One line drawings are provided for all systems.	
7. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
9. Preliminary wire notes, and wire and conduit schedule is provided.	
10. Detailed pathways for fiber optic cables into the spaces.	
11. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans.	
12. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
13. Riser diagrams are provided for all systems.	
14. Construction notes on layout sheets are provided.	
15. Standard and special detail drawings and specifications are provided.	
16. Fiber optic communications schematics and single line diagram with fiber count shown.	
17. Temporary communications plan provided	
18. Power service locations, and panel service details provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS TELECOMMUNICATIONS SPACES – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction has been developed, submitted, reviewed, and approved.	
4. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.)	
5. Maintenance plan for existing communications assets during construction has been developed, submitted, reviewed, and approved.	
6. Known Letters of Concurrence submitted to the AHJ.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. HVAC & Power calculations for final loads completed and approved.	
3. Loss calculations (e.g. fiber optic, radio signal) have been finalized.	
4. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
5. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) and transformers have been finalized.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	
2. Interdisciplinary coordination complete including: Communications review of non-communication specifications, with attention paid to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, cable hangers, securing couplers inside junction boxes, and concrete anchors, etc. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical and architectural package (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Structural: Communication equipment mounting and conduit details (e.g. penetrations) have been finalized and detailed with structural discipline. Updated specification references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
3. Completed tasks from the Project Integration and Implementation Plan: <ul style="list-style-type: none"> a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model. 	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	

General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Key plans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table.	
4. Communication block diagrams are provided for all systems.	
5. Schematic drawings showing connection details are provided for all devices.	
6. Mounting details for all communication assets are shown.	
7. One-line drawings are provided for all systems.	
8. Network topology and fiber cabling one line.	
9. Conduit and cable schedules.	
10. Fiber splicing diagram and schedules.	
11. Fiber patching details and schedules.	
12. Network panel/rack layouts.	
13. Final details shown and dimensioned.	
14. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
15. Finalized wiring and conduit schedule is provided.	
16. Finalized network equipment schedule and VLANs are shown for all networked assets.	
17. Equipment schedule is provided encompassing all communication assets.	
18. Drawings are coordinated with the specifications: Terminology is consistent between the two documents. Specified materials and products are consistent between the two documents.	
19. Riser diagrams are provided.	
20. Construction notes on layout sheets are provided.	
21. Standard and special detail drawings and specifications are provided.	
22. Cabinet layout drawings are provided for all systems.	
23. Temporary communications plan provided.	
24. Power service locations, and panel service details provided.	
25. Transformer / breaker schedule provided.	
26. I/O Schedules and description of operations.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: COMMUNICATIONS TIDS – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build) Basis of design report has been submitted with sufficient detail to define strategy for meeting all communications design requirements. This includes operational approach and system architectures. Assumptions are to be stated including those preliminary requirements defined by the AHJ. The report must include the following sections: a) Introduction b) Design strategies and system descriptions c) Assumptions d) Strategy for providing maintainability e) Strategy for addressing redundancy f) Code compliance and identification of areas of concern g) Identify design elements that specifically mitigate hazards identified in preliminary hazard assessments h) Sustainability scope of work identified by the sustainability checklist	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical cross discipline coordination issues identified. (Communications space room sizes, mechanical/electrical needs).	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews (Communications space room sizes, multi-use poles, conduit coordination, guideway element coordination).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. Include any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Preliminary design schematics and Sequence of Operations in construction documents. d. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Identify areas of CCTV coverage (field-of-view).	
4. Network media limitations and proposed end device locations.	
5. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, mechanical, and other disciplines, particularly for anticipated construction sequence and location/size of communication rooms and closets, cabinets, conduits, mounting of end devices, and electrical power supply.	
6. Location of key TIDS equipment.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Outline specifications.	
2. List of potential or planned Specification Modification Requests of Standard Specifications.	
3. Cutsheets of systems or devices that design is proposed to be based on.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols.	
2. Proposed final drawing list with titles and drawing numbers.	
3. Keyplans and general arrangement plans shown with labels and sectors identified	
4. Electrical service location, type, and size shown in plans and summary table.	
5. Communication block diagrams are provided for TIDS.	
6. Communications rooms, cabinets, and bungalows shown on plans.	
7. Riser drawings are provided for TIDS.	
8. Network topology and fiber cabling one line.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable.	

EP-03 CHECKLIST: COMMUNICATIONS TIDS– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo updated to a FINAL state.	
2. Design deviations or design exceptions have been identified and submitted.	
3. Technical memoranda have been drafted.	
4. Known letters of concurrence drafted or completed. List below and status.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Loss calculations (e.g. fiber optic) have been performed.	
2. Coverage maps (i.e. field-of-view) have been developed. Identify any copper runs estimated to be near or over media distance limitations.	
1. Service load calculations have been provided (electrical loads and UPS loads). Verify meeting service requirements.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Verify maintainability clearances.	
4. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
5. Responded to and addressed all issues identified in previous Constructability Reviews.	

6. Equipment designed included in Clash Detection models.	
7. Support of development of circulation diagrams of all equipment and verification of maintainability clearances.	
8. Participate in and resolve issues identified in Gap Analysis of BIM models.	
9. Equipment in design complies with identify Buy America compliant equipment.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% are resolved. Identify any new critical issues.	
2. Interdisciplinary coordination initiated and included: Coordination with architects, structural, electrical, and other disciplines, particularly for anticipated construction sequence and location of communication rooms, cabinets, conduits, mounting of end devices, and electrical power supply. Also coordination of room and cabinets sizing.	
3. Electrical: Determine power requirements for communication assets. Ensure electrical discipline provide power supply for communication equipment Mechanical: Determine and coordinate HVAC/ventilation requirements to ensure adequate environmental conditions are provided for communication equipment (with rooms, closets, or within cabinets). Architectural: Coordinate with architectural discipline for placement of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies). Working clearances sufficient for all maintenance and other future activities. Structural: Coordinate with structural discipline and all disciplines on location of conduits (e.g. penetrations) or mounting locations of comm devices (e.g. TIDS, CCTV, PLC). Coordinate seismic requirements. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).	
4. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. c. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. d. Participate in Gap Analysis using BIM model.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	
2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table. Include PLCs, CCTV, and TIDS.	
4. Communication block diagrams are provided for TIDS.	
5. Mounting details for all communication assets are shown and dimensioned, including pathway strategy.	
6. One line drawings are provided for all systems.	
7. Network topology and fiber cabling one line.	
7. Preliminary details shown and dimensioned, including voice/data video utility outlets.	
8. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
9. Preliminary wire notes, and wire and conduit schedule is provided.	
10. Network equipment schedule and VLANs are shown for all networked assets.	
11. Equipment schedule is provided encompassing all communication assets, including room and bungalow equipment layout plans.	
12. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
13. Riser diagrams are provided for TIDS.	
14. Construction notes on layout sheets are provided.	
15. Standard and special detail drawings and specifications are provided.	
16. Fiber optic communications schematics and single line diagram with fiber count shown.	
17. Temporary communications plan provided.	
18. Power service locations, and panel service details provided.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: COMMUNICATIONS TIDS – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Report (Final at 60%).	
2. Technical memoranda have been submitted, reviewed, and approved.	
3. Plan for continuity of existing communications during construction, has been developed, submitted, reviewed, and approved.	
4. Phased migration plans for critical system cutovers (system required to stay online during construction or temporary network configurations.)	
5. Maintenance plan for existing communications assets during construction, has been developed, submitted, reviewed, and approved.	
6. Known Letters of Concurrence drafted or completed. List below and state status.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted- electronic submittal acceptable- unstamped.	
2. Loss calculations (e.g. fiber optic, radio signal) have been finalized.	
3. Sizing for conduits, raceway, pull boxes, manholes have been finalized.	
4. Calculations (e.g. voltage drop) for wiring layout (wire sizes, wire type, and length) and transformers have been finalized.	
5. Power budget calculations (UPS, PoE, Power panels).	
6. Coverage maps (i.e. TIDS field-of-view) have been finalized. Finalize all copper media distance limitation issues.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Incorporated agreed upon analysis (value, safety, or security analysis).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary issues resolved and complete.	

<p>2. Interdisciplinary coordination complete including: Communications review of non-communication specifications, with attention paid to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, cable hangers, securing couplers inside junction boxes, and concrete anchors, etc. Electrical: Power requirements for communication assets (normal and UPS power) have been finalized and coordinated with electrical package. Mechanical: HVAC/ventilation requirements for communication equipment have been finalized and coordinated with mechanical and architectural package (with rooms, closets, or within cabinets). Architectural: Location of communications infrastructure (e.g. communications rooms, cabinets, bungalows, canopies) has been finalized and detailed. Working clearances sufficient for all maintenance and other future activities. Structural: Communication equipment mounting and conduit details (e.g. penetrations) have been finalized and detailed with structural discipline. Updated specification references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc. Controls: Coordination with control systems including definition of inputs/outputs to TCS, BMS, EVS, or fire life safety systems (FACP).</p>	
<p>3. Completed tasks from the Project Integration and Implementation Plan:</p> <ol style="list-style-type: none"> a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. e. Gap Analysis using BIM model. 	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. Include legend of abbreviations and symbols. General notes identify applicable design codes and criteria (e.g. bandwidth), construction and/or fabrication requirements and limitations, deferred and/or special submittals, testing and inspection requirements, etc.	

2. Keyplans and general arrangement plans shown with labels and sectors identified	
3. Electrical service location, type, and size shown in plans and summary table.	
4. Communication block diagrams are provided for TIDS.	
5. Schematic drawings showing connection details are provided for all devices.	
6. Mounting details for all communication assets are shown.	
7. One line drawings are provided for all systems.	
8. Final details shown and dimensioned.	
9. Proposed and/or existing conduits located, sized (via fill ratios), and labeled in plans, details, and schedule.	
10. Finalized wiring and conduit schedule is provided.	
11. Finalized network equipment schedule and VLANs are shown for all networked assets.	
12. Equipment schedule is provided encompassing all communication assets.	
13. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	
14. Riser diagrams are provided for TIDS.	
15. Construction notes on layout sheets are provided.	
16. Standard and special detail drawings and specifications are provided.	
17. Cabinet layout drawings are provided for all systems.	
18. Temporary communications plan provided	
19. Power service locations, and panel service details provided.	
20. Transformer / breaker schedule provided.	
21. I/O Schedules and description of operations.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: ELECTRICAL – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design (BOD) report has been submitted with sufficient detail to define the strategy for electrical power, electrical raceway and electrical lighting delivery, including load analysis, utility service interconnection, equipment layout, and backup power approach. The design memo shall reference all applicable codes and specific requirements that support the design concept. All assumptions are to be stated including those preliminary requirements defined by the AHJ. Basis of Design Report including and not limited to: <ul style="list-style-type: none"> a. Introduction, b. Design strategy and systems description c. References d. Assumptions including operational approach. e. Code compliance and identification of areas of concern f. Identify any design elements that specifically mitigate hazards identified in Preliminary Hazard Assessments, g. <u>Incorporation and highlight of Sustainability features identified in Sustainability checklist.</u> h. Outline lighting strategy, including layout, installation, controls, and fixture types as outline in STRM SET 1007. 	
2. Technical memoranda or reports, if needed for providing detail to support design, identify a list have a minimum of 30% level drafts developed.	
3. Letters of Concurrence, if needed, have been identified in a list below.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence, if any:

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C. Calculations:

ACTION	Y/N
1. Electrical Power:	

<ul style="list-style-type: none"> a. Critical electrical system issues identified. b. Load estimate, provide separate load estimates for each facility. c. Establish system service configurations. d. Develop preliminary one-line diagram. 	
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List proposed Requests for Deviation, if any:

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D. Constructability

ACTION	Y/N
<ul style="list-style-type: none"> 1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews. 2. Develop designs and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual, including conduit routing and wire and conduit schedules. 	

E. Interdisciplinary Coordination:

ACTION	Y/N
<ul style="list-style-type: none"> 1. Interdisciplinary coordination initiated with respective disciplines. Identify any issues that have arisen or information that is lacking in BOD. 2. Electrical Power and Electrical Raceway: <ul style="list-style-type: none"> a. Actively participated in design team, Project Integration Implementation Plan, and support plan identified deliverables: <ul style="list-style-type: none"> i. Point to Point responsibility diagrams are complete. ii. Interface Block Diagrams drafted with Concept of Operations outlined. iii. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
<ul style="list-style-type: none"> b. Interfaces defined and coordinated: <ul style="list-style-type: none"> i. Coordinate with Utility Company for power service location and requirements. ii. Plan/location of Electrical Vaults iii. Plan/location of Utility transformer and utility meter. Utility meter must be located outdoors. iv. Plan/location of Electrical switchgear, panels, transformers, UPS and generator plug or standby generator, including size layouts of transformers, switchgear and generator. v. Electrical and Systems routing to confirm feasibility and spatial requirements. vi. Routing of electrical and systems in guideway or along trackway to confirm spatial requirements. vii. Description – Type and size of backup power system. viii. Confirm required generator provisions are accounted for including service space and interfaces. ix. Location and Schematic plan for UPS. 	

<ul style="list-style-type: none"> <li style="margin-left: 40px;">x. Provide and coordinate the requirement for Fire Systems with Utility services. <p>3. Electrical Lighting:</p> <ul style="list-style-type: none"> <li style="margin-left: 20px;">a. Provide input into Code Analysis for Lighting and Energy Calculations. <li style="margin-left: 20px;">b. Coordinate with Arch. 	
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List ICDs:

F. Specifications:

ACTION	Y/N
1. Table of Contents for planned specifications	
2. List of potential or planned Specification Modification Requests	

G. Drawings:

ACTION	Y/N
1. Drawings as outlined in the Design Technology Manual: <ul style="list-style-type: none"> a. General Electrical Notes, Abbreviations and Legend b. Utilities Series for electrical and telephone <ul style="list-style-type: none"> i. Identifying Point of Connection and routing from building to ROW. 	
c. Power One-Line Diagram.	
d. Key Plan	
e. Power Plans <ul style="list-style-type: none"> i. Site Plans ii. Floor Plans 	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities

ACTION	Y/N
1. Support development of preliminary Equipment Matrix as part of the PIIP.	

EP-03 CHECKLIST: ELECTRICAL – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Report final by 60%.	
2. Technical memoranda have been approved.	
3. Letters of Concurrence have been approved from Fire Department and O&M on location of FDCs and FHs	
4. Design identifies ICDs (Interface Control Documents). Respond to ICDs requiring input from design.	
5. Incorporation of sustainability features identified in the Sustainability Checklist.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC), if any:

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List ICDs:

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C. Calculations:

ACTION	Y/N
1. Electrical Power:	
a. Initial calculations and studies specified in STRM SET 1005.	
2. Electrical Raceway:	
a. Initial conduit fill calculation.	
3. Electrical Lighting:	
a. Initial lighting calculation specified in STRM SET 1007.	
4. Input into the Energy usage/budget calculations.	

D. Constructability

ACTION	Y/N
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1. Update potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Update designs and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual, including conduit routing and wire and conduit schedules.	
3. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
4. Responded to and address all issues identified in previous Constructability Reviews.	
5. Confirm specified equipment complies with Buy America.	
6. Support development of Equipment Circulation Diagrams.	
7. Clearance space for electrical equipment in compliance with code.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% level resolved.	
2. Interdisciplinary coordination initiated and included:	
a. Electrical Power	
i. Confirm working space around electrical equipment and egress from electrical rooms meets code.	
b. Electrical Raceway	
i. Raceway routes have been coordinated and identified with architect, structural and civil for both normal, emergency and lighting control.	
c. Electrical Lighting	
i. Light fixtures have been coordinated and identified with architect, structural and civil for both normal and emergency lighting.	
3. Incorporate sustainable features determined in the Sustainability Checklist.	
4. Incorporated ST approved ATCs (for Design-Build). Describe.	
5. Initial PIIP (Project Integration Implementation Plan) has been started.	
6. Initial seismic calculation has been started for electrical equipment and devices.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	
3. ST Standard Commissioning Specifications has been evaluated and adjusted accordingly and coordinated with design.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Drawings as outlined in the Design Technology Manual, and the following drawings below are in working progress:	
a. Power One-Line Diagram	
b. Panel Schedules	
c. Equipment Schedules	
d. Power Plans:	
i. Emergency Ventilation system	
e. Wire/Cable and Conduit Schedule	
f. Lighting Fixture Schedules	
g. Lighting Control Sequence or Lighting Control Matrix	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard are complete	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: ELECTRICAL – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates Basis of Design Report (Finalized at 60%).	
2. Updated and final Technical Memoranda have been submitted.	
3. Confirm all approved letters of concurrence have been received.	
4. Permit drawings have been submitted for approval.	
5. Design incorporates disposition of resolved ICDs (Interface Control Documents). Respond to ICDs requiring input from design.	
6. Incorporation of all identified and approved sustainability features.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC), if any:

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List ICDs:

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C. Calculations:

ACTION	Y/N
1. Electrical Power:	
a. Calculations and studies are completed. See STRM SET 1005.	
2. Electrical Raceway:	
a. Final conduit fill calculation is completed.	
3. Electrical Lighting:	
a. Final lighting calculation specified in STRM SET 1007 are completed.	
4. Final Energy usage/budget calculations are completed.	

D. Constructability

ACTION	Y/N

1. Constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08 is resolved. Design information to support Constructability Reviews are finalized and submitted.	
2. Designs and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual, including routing and wire and conduit schedules are completed.	
3. RFP requirements including ST approved construction sequencing (Design-Build only) are completed.	
4. All issues identified in previous Constructability Review are addressed and completed.	
5. Final equipment and devices are compliant with Buy America.	
6. Final Equipment Circulation Diagrams including door height to accommodate the removal or replacement of an electrical equipment has been submitted and approved.	
7. Final location of the electrical equipment with clearance space in compliance with code.	
8. Completed and finalized the NFPA 130 requirement for Light Rail Vehicle station and tunnels.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is completed.	
2. Interdisciplinary coordination is completed and resolved:	
a. Electrical Power – all issues identified at 60% level are completed.	
b. Electrical Raceway – all issues identified at 60% level are completed.	
c. Electrical Lighting – all lighting issues identified at 60% level are completed.	
3. Sustainability Checklist is completed.	
4. ST approved ATCs (for Design-Build) is completed.	
5. PIIP (Project Integration Implementation Plan) is completed.	
a. Final Raceway schedule match the final PIIP and Interface Block Diagram (IBD)	
b. ICD coordination with other designers is completed.	
6. Electrical equipment including lighting control panel and cable tray mounting are coordinated and completed.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with drawings.	

G. Drawings:

ACTION	Y/N
1. Drawings as outlined in the Design Technology Manual are completed and all comments that have been agreed upon are already incorporated.	
2. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard have been completed and incorporated in both drawings and Spec.	

Provide notes on the implementation of ST Standard and Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: FIRE LIFE SAFETY – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design studies, analysis, reports, and memos with sufficient detail to define the strategy for and necessary for this stage of design including FLS Set 601 requirements and the following:	
a. Tunnel and station emergency ventilation systems (EVS) system-wide integration basis of design including preliminary CFD modelling analysis, SES analysis, system wide emergency response matrix with ventilation modes, and test plan.	
b. Stair and elevator pressurization basis of design that accounts for fan location, relief damper location, injection points, control, and operation sequence, and fire fighter smoke control panel (EVS interface).	
c. A code study (municipal code drawings) regarding construction type and fire/life safety requirements of the IBC and NFPA 130. See FLS 601 for specific requirements.	
d. A means of egress analysis using ST excel template, or equal, for light rail stations that can be compared to the tenability analysis from CFD modelling listed above.	
e. Fire protection basis of design includes the extent of protection, suppression types, consideration for freeze protection, and facility configuration. The BOD shall reference all applicable codes and specific requirements that support the design concept. All assumptions are to be stated including AHJ requirements.	
f. Fire alarm system basis of design that outlines applicable codes, areas of coverage, number of systems, notification type, main panel locations. The design memo shall reference all applicable codes and specific requirements that support the design concept. All assumptions are to be stated including AHJ requirements.	
2. The basis of design studies, analysis, reports, and memos must be organized with appropriate section headers including a section for applicable code references. ST requirements must be reflected.	
3. Fire protection and fire alarm basis of design (items e and f above) must be provided through fire protection/fire alarm system plan sheets that include symbols, general note, key plan notes, and drawing markups to reflect design criteria areas, and specifics listed in the drawing section below. A design memo to complement the drawings may be provided if necessary. This requirement applies to all delivery methods including design build.	

List Other BODS, Reports, Analysis, and Technical Memoranda, if any:

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List proposed Requests for Deviation, if any:

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List open/resolved ICDs, if any:

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C. Agreements

ACTION	Y/N
1. Items requiring formal agreements (Letters of Concurrence) with AHJs as outlined in FLS Set 601 have been identified and dialog begun with ST SMEs and AHJs.	

D. Calculations:

ACTION	Y/N
1. Preliminary calculations to determine the need for a fire pump. Calculations must be performed by a qualified professional engineer.	
2. Site fire flows (through testing or hydraulic modelling) and confirm through calculations that fire flows meet minimum required for construction type per the IFC.	
3. Preliminary means of egress calculations (may be included in municipal code sheets or provided in a separate submittal)	
4. Preliminary SES/CFD calculation for fan sizes for tunnel and station emergency ventilation including stairs and elevators pressurization systems may be presented in the BOD report.	

E. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for constructability reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Develop designs and drawings in compliance with BIM (Building Information Modeling) and 3D modeling requirements of the Design Technology Manual.	
3. Confirm specified equipment complies with Buy America requirements.	

F. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination initiated with respective disciplines. Identify any issues that have arisen or information lacking in BOD.	

<p>2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables:</p> <ol style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
<p>3. Interdisciplinary coordination initiated and included:</p> <ul style="list-style-type: none"> • Fire department access • Ventilation shaft and inlet/outlet locations for fan plants • Coordination with architect and other disciplines as needed • Preliminary space proofing • Design strategy for coordination • Locations of fire hydrants, fire department connections, and fire hose valves • Fire riser room locations • Seismic/expansion joints accounted for fire protection design • Water supply points of connection and preliminary sizing • Water supply requirements for fire flows • Drainage of fire flows is coordinated with plumbing and/or civil • Stakeholders and AHJ coordination • Preliminary electrical coordination of equipment power • Guideway emergency access and standpipe FDC and hydrant locations identified. 	

Description of interdisciplinary coordination efforts:

G. Specifications:

ACTION	Y/N
1. Table of Contents for planned specifications, including designer furnished and ST standard specifications, and commissioning specifications.	
2. List of potential or planned Specification Modification Requests	

H. Drawings:

ACTION	Y/N
1. Code Analysis by Lead Registered Design Professional: Municipal code sheets that provide a code study including content outlined in FLS Set 601 Show real and assumed property lines for fire separation distance and perform analysis. Identify any areas of non-conformance requiring resolution.	
2. Fire Department Access: Guideway fire department access points	
3. Fire Department Access: Demonstrate code understanding through a building/station site plan showing code conformance.	
4. Fire command center/fire control room location, when applicable.	

5. Fire Protection: Plans identify areas to be provided with fire protection (narrative or graphic is acceptable), number of systems, location of riser room, major equipment, water supply points of connection, fire department connections, symbols, general notes, main riser locations and associated sanitary sewer.	
6. Fire Protection: Areas to be protected with clean agent fire suppression.	
7. Fire Alarm: Panel locations (FACP, NAC, power supply), main electrical risers, annunciation type.	
8. Standpipes (all facilities including trainways): Location of FDCs, main risers and representative location of fire hose valves.	
9. Trainway standpipe system drawings provided with professional engineer stamp/seal when required per FLS Set 601.	
10. Emergency ventilation fans (tunnel, stair, elevator, other) and associated plenums and dampers.	
11. Preliminary station and tunnel emergency ventilation drawings indicating smoke control strategy and reference to BOD report.	
12. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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I. Quantities:

ACTION	Y/N
1. Support development of preliminary Equipment Matrix as part of PIIP (Project Integration and Implementation Plan)	

EP-03 CHECKLIST: FIRE LIFE SAFETY – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design required by FLS Set 601 and listed in EP-03 (30 percent) have been finalized.	
2. Updated studies, analysis, reports, and memos have been drafted and provided for review and comment.	
3. Design incorporates disposition of resolved ICDs (Interface Control Documents). Respond to ICDs requiring input from design.	
4. Provide a preliminary reliability analysis and report for the emergency ventilation system for tunnels and stations as outlined in NFPA 130 chapter 7.	
5. Provide a preliminary functionality, reliability, and control engineering analysis report addressing NFPA 130 Chapter 11 requirements including a hybrid fire alarm/public address system for alarm notification and emergency voice messages.	
6. Provide a preliminary stair and elevator pressurization system rational analysis report, or equal, as defined in IBC 909 to confirm air balance and door force for various operational scenarios. This report may be combined with the EVS report listed above.	

List all studies, analysis, reports and memos and status (i.e., completed, in development, updated):

Document	Status

List Design Deviations, if any:

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List open/resolved ICDs, if any:

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C. AHJ FLS Agreements

ACTION	Y/N
1. Formal agreements and letters of concurrence as outlined in FLS set 601 and as otherwise required are developed and signed by AHJs.	

List agreements needed and status (e.g., to be developed, draft, in development, pending signature, approved).
See FLS Set 601 Section 601.7:

Agreement	Status

D. Calculations

ACTION	Y/N
1. Equipment and pipe sizing including preliminary fire pump sizing (if applicable).	
2. Preliminary standpipe and sprinkler systems hydraulic calculations including fire hose connection pressures and filling time.	
3. Guideway standpipe hydrant flow data obtained and validated to meet demand.	
4. Preliminary tunnel/guideway standpipe system supports (seismic, thrust, water hammer), pipe stress and support calculations.	
5. Site fire flows (or modelling information where flows not permitted) completed and submitted.	
6. Means of egress calculations updated.	
7. Final SES/CFD calculation for fan sizes for tunnel and station emergency ventilation including stairs and elevators pressurization systems may be presented in the BOD report.	

E. Constructability

ACTION	Y/N
1. Potential constructability issues identified	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Develop designs and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual.	
4. Confirm specified equipment complies with Buy America requirements.	

F. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% level resolved.	
2. Interdisciplinary coordination initiated and included: <ul style="list-style-type: none"> • Fire access locations and access means finalized and preliminarily approved by the AHJ. • The system-wide emergency response matrix for integration of fire alarm, emergency fans, dampers, VMS, BMS, PA, door locks, deluge valve control, and other system interfaces. 	

<ul style="list-style-type: none"> • Ventilation shaft, plenum, and inlet/outlet for fan plants coordinated with architectural design and validated through modelling. • Space proofing is complete. • Number of wet-pipe, dry-pipe and standpipe systems identified for riser room(s) location and size. • Main fire protection supply lines coordination with structure to ensure draining of dry systems. • Clean agent containment (architectural and mechanical coordination) • Fire alarm system conditioned space requirements determined and identified. • Coordination of structural attachments and penetrations for fire protection system mains • Fire hydrants and fire department connection locations finalized. • Drainage of fire protection main drains and tunnel fire flows is sized correctly in coordination with plumbing and/or civil (sanitary sewer). • Routing of pipe mains and fire hose cabinets are coordinated with architectural design. • Emergency power is coordinated with FLS equipment requiring emergency or standby power. 	
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List open/resolved ICDs, if any:

Description of interdisciplinary coordination efforts:

G. Specifications:

ACTION	Y/N
1. Preliminary specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	
3. Commissioning specifications included with identified adjustments specific to the design prior to modification request	

List any modification requests for ST Standard Specifications:

H. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started.	
2. Key plans and general arrangement plans shown with labels and sectors identified.	
3. Code Analysis by Lead Registered Design Professional: Municipal code sheets updated.	

4. Fire Department Access: Guideway fire department access points final.	
5. Fire Department Access: Building/station fire access final.	
6. Fire command center/fire control room location, size, and preliminary arrangement of equipment.	
7. Fire Protection: Plans further developed to show 30 percent requirements plus, fire pump (where applicable), valves, major supply lines and cross mains, heat tracing (if proposed) and location of main and auxiliary drains. Narrative expanded with general and key notes. NFPA 13 and NFPA 14 design criteria including hazard classification reflected in drawings. Where sizing and detailed routing will be performed by fire protection contractor, notes and/or specifications clearly indicate boundaries and constraints that must be met.	
8. Fire Protection: Clean agent design further developed to show 30 percent requirements plus panel location, bottle location, number of rooms served per system.	
9. Fire Alarm: Plans further developed to show 30 percent requirements plus <ol style="list-style-type: none"> a. Fire alarm system riser diagram (preliminary) b. Plan drawings showing main FACP, annunciator (if provided) power supply (NAC) panels, field device locations, interface with controlled equipment and a preliminary riser diagram. c. Fire alarm device mounting height diagram. d. Preliminary sequence of operation specific to the fire alarm system provided. 	
10. Preliminary light rail system emergency response matrix (ERM) developed.	
11. Standpipes (all facilities including trainways): Plans further developed to show 30 percent requirements plus standpipe routing, and all required fire hose valve locations.	
12. Trainway standpipe system drawings provided with professional engineer stamp/seal when required per FLS Set 601.	
13. Emergency ventilation System: Plans further developed from 30 percent requirements to include, isolation dampers, barometric relief dampers and other key components that need to be determined at this stage of design.	
14. Pipe support locations identified and pipe supports designs are detailed. Where performed by fire protection contractor, notes and/or specifications clearly indicate such direction.	
15. Preliminary details shown. Critical elevations and clearances are indicated. Equipment enclosures are identified.	
16. Drawings are coordinated with the specifications: <ul style="list-style-type: none"> • Terminology is consistent between the two documents. • Specified materials and products are consistent between the two documents. 	
17. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

I. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: FIRE LIFE SAFETY – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Municipal codes drawings final, comments resolved and ready for AHJ review.	
2. Technical memoranda and engineering reports have been submitted, reviewed, and approved.	
3. Design incorporates disposition of resolved ICDs (Interface Control Documents). Respond to ICDs requiring input from design.	
4. Provide final reliability analysis and report for the emergency ventilation systems for tunnels and stations as outlined in NFPA 130 chapter 7.	
5. Provide final functionality, reliability, and control engineering analysis report addressing NFPA 130 Chapter 11 requirements including a hybrid fire alarm/public address system for alarm notification and emergency voice messages.	
6. Provide final stair and elevator pressurization system rational analysis report, or equal, as defined in IBC 909. This report may be combined with the EVS report listed above.	

List all studies, analysis, reports and memos and status (i.e., completed, in development, updated):

Document	Status

List Design Deviations, if any:

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List open/resolved ICDs, if any:

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C. AHJ FLS Agreements

ACTION	Y/N

1. Formal agreements and letters of concurrence as outlined in FLS set 601 and as otherwise required have been completed and approved by the AHJ.	
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List agreements needed and status (e.g., to be developed, draft, in development, pending signature, approved).
See FLS Set 601 Section 601.7:

Agreement	Status

D. Calculations

ACTION	Y/N
Calculations completed and submitted for the following:	
1. Final Equipment and pipe sizing including fire pump sizing.	
2. Final hydraulic EOR calculations for automatic sprinkler system, guideway standpipe system, reflecting pipe type. Indicate final calculations for AHJ approval to be delegated design where applicable.	
3. Guideway EOR standpipe fill time. Indicate final calculations for AHJ approval to be delegated design where applicable.	
4. Final EOR tunnel/guideway standpipe systems supports (seismic, thrust, water hammer), pipe stress and support calculations. Indicate final calculations for AHJ approval to be delegated design where applicable.	
5. Final EOR guideway standpipe thermal expansion calculations. Indicate final calculations for AHJ approval to be delegated design where applicable.	
6. Final means of egress calculations.	

E. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Develop designs and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual.	
4. Confirm specified equipment complies with Buy America requirements.	

F. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines complete.	
2. Interdisciplinary review included: <ul style="list-style-type: none"> • Penetrations through structural and architectural assemblies • System interface between FACP, clean agent, elevator, PA, EVS, and BMS. • The system-wide emergency response matrix for integration of fire alarm, emergency fans, dampers, VMS, BMS, PA, door locks, deluge valve control, and other system interfaces. • Fire protection main and low point drains identified and accessible. • Corrosion control addressed at system interfaces (dissimilar materials) 	

<ul style="list-style-type: none"> • Final ventilation shaft, plenum, and inlet/outlet for fan plants coordinated with architectural design and validated through modelling. • Fire riser, FCC, FRC rooms equipment layout coordinated. • Final clean agent room design regarding sealing, firestopping, and smoke dampers. • Confirm fire alarm system equipment aligns with conditioned space requirements. • Fire hydrants and fire department connection locations finalized. • Routing of pipe mains and fire hose cabinets are coordinated with architectural design. • Final emergency power design is coordinated with FLS equipment requiring emergency or standby power. 	
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List open/resolved ICDs, if any:

Description of interdisciplinary coordination efforts:

G. Specifications:

ACTION	Y/N
1. Comments from previous submittal resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard and Guide Specification modification requests.	
3. Incorporate all previously approved ST Standard Specification modification requests. Complete all Standard Specification modifications, including tailoring commissioning specifications to the design and project and identification of Integrated Testing needs for the design.	

List any modification requests for ST Standard Specifications:

H. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started.	
1. Key plans and general arrangement plans are complete, fully annotated, and referenced	
2. Plans and sections are complete, fully annotated and referenced.	
3. Detail drawings are complete, dimensioned, fully annotated, and referenced.	
4. Special considerations for sprinkler heads within public spaces are identified.	
5. System main and auxiliary drains are identified.	

6. Floor/wall penetrations identified.	
7. Details of flexible and/or expansion fittings are complete.	
8. Drawings are coordinated with the specifications: <ul style="list-style-type: none"> • Terminology is consistent between the two documents. • Specified materials and products are consistent between the two documents. 	
9. Fire main piping drain direction indicated (dry-pipe sprinklers and dry standpipe systems).	
10. Fire command center/fire control room location, size and final arrangement of equipment.	
11. Fire protection and standpipe: Comments from previous reviews incorporated. Plans further developed from 60 percent to show all information required for seamless transition to engineering technician to develop shop drawings and calculations for AHJ review and approval.	
12. Fire Protection: Clean agent system plans further developed from 60 percent to show all information required for seamless transition to engineering technician to develop shop drawings and calculations for AHJ review and approval. Sequence of operating specific to the clean agent system provided.	
13. Fire Alarm: Plans further developed from the 60 percent submittal to show all information required for seamless transition to engineering technician to develop shop drawings and calculations for AHJ review and approval. Include: <ol style="list-style-type: none"> a. Final fire alarm system riser diagram. b. Final plan drawings showing main FACP, annunciator (if provided) power supply (NAC) panels, field device locations, interface with controlled equipment and a preliminary riser diagram. c. Final fire alarm device mounting height diagram. d. Show other raceway as required for coordination and aesthetics. e. Final sequence of operation specific to the fire alarm system provided. 	
14. Final light rail system emergency response matrix (ERM) developed.	
15. Guideway Standpipes: Final plans showing piping segments, coupling, FDC, hydrants, support, braces, expansion joints, fire hose valve, air release vacuum valves, and underground piping. Equipment schedules, and standard details.	
16. Trainway standpipe system drawings provided with professional engineer stamp/seal when required per FLS Set 601.	
17. Emergency ventilation System: Plans further developed from 60 percent requirements to include all components including power and cable routing and means of protection (survivability).	
18. Critical elevations and clearances are indicated. Equipment enclosures are identified.	
19. Drawings are coordinated with the specifications: <ul style="list-style-type: none"> • Terminology is consistent between the two documents. • Specified materials and products are consistent between the two documents. 	
20. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

I. **Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)**

ACTION	Y/N
1. Include equipment in Equipment Matric as part of integration efforts.	
2. Specifications include identification of spare parts and equipment to be supplied.	

EP-03 CHECKLIST: GEOTECHNICAL – PRELIMINARY ENGINEERING (30%) (for Design-Build)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted	
2. Geotechnical investigation work plan has been submitted, reviewed, and approved to meet minimum field investigation requirements in Requirements Manual (STRM)	
3. Prepare draft of right of entry requests for geotechnical investigations	
4. Identify permits required for geotechnical investigations.	
5. Pre-bid Final /Preliminary Geotechnical reports have been submitted, reviewed, and approved (tailor following content to the project needs and scope) based on preliminary alignment.	
a. Cover Page citing structure name, number, stationing, design milestone, and date	
b. Table of contents	
c. Description of project scope/purpose	
d. Summary of design criteria (STRM, AASHTO, IBC, etc.)	
e. Summary of office research/literature review	
f. Description of geologic setting	
g. Description of seismic setting (regional tectonics, significant historic earthquakes, proximate faults and degree of activity)	
h. Geotechnical and geologic hazards (ground shaking, fault rupture, tsunami/seiche, liquefaction and related phenomena (lateral spreading), landslides/slope instability, subsidence, subsurface gases), evaluated and mitigation strategies assessed	
i. Complete geotechnical investigation, laboratory and in-situ testing to meet minimum field investigation requirements in RM for the preferred alternative.	
j. Investigations in support of the FEIS (Final Environmental Impact Statement) completed and results incorporated into the FEIS.	
k. Description of soil and rock conditions	
l. Description of groundwater conditions and submittal of groundwater level reading	
m. Geotechnical risks are included with appropriate weighting in the risk ledger at Pre-bid Final /PE level.	
n. Cost estimate reflects geotechnical risk associated with the proposed project element at Pre-bid Final /PE level	
o. Summary of laboratory testing	
p. Summary of hydraulic conditions affecting foundation recommendations	
q. Boring logs, laboratory testing results, and geologic profile complete for the preferred alternative.	

r.	Seismic analysis and evaluation (MDE/ODE/MCE spectral values and Site Class; liquefaction triggering; probabilistic seismic hazard analysis (PSHA) and preliminary acceleration time history analysis (long-span bridge only. See Long Span Guideway Structure Checklist for the definition of long span bridge.)	
s.	Recommendations for structure foundation and track support with Pre-bid Final/PE design complete.	
t.	Pile foundation recommendations (types; sizes; nominal axial resistance vs. depth; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev)	
u.	Drilled shaft foundation recommendations (types, sizes, rock socket lengths; nominal axial resistance vs. depth/elev; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev)	
v.	Spread footing foundation recommendations (description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity, coefficient of base friction)	
w.	Recommended retaining wall types identified (summary of wall types; description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability, sliding, and overturning checks; earth pressure recommendations and diagrams; earth anchor capacity) with preliminary design complete.	
x.	Recommendation for underground structures excavation, dewatering and support method(s).	
y.	Earthwork recommendations (maximum cut/fill slopes)	
z.	Slope stability recommendations (minimum factor of safety requirements in static and seismic condition; minimum retention requirements)	
aa.	Stormwater quality facility requirements (recommended basin elevation, infiltration testing method and parameters)	
bb.	Identify critical right-of-entry and permitting necessary for future phases of the work.	
cc.	Identify potential Low-Impact-Development (LID) locations	
dd.	Feasible construction methods identified.	
ee.	Summarize geotechnical Risk and provide recommendations for Final Design (FD) level analyses to address risks, include in risk register.	
ff.	Ground improvement recommendations (types, locations)	
gg.	Groundwater level reading submitted.	

hh. Geotechnical instrumentation recommendations (types, locations)	
ii. Construction issues and recommendations (subsurface obstructions; support-of-excavation; sensitive adjacent structure; groundwater control; grout control/fluid loss)	
jj. Appendix – vicinity map	
kk. Appendix – exploration location plan	
ll. Appendix – exploration logs	
mm. Appendix – in-situ testing results	
nn. Appendix – site photographs	
oo. Appendix – rock core photographs	
pp. Appendix – others as needed	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. NA	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete.	
2. Interdisciplinary review included: Geotechnical review of non-geotechnical plans and specifications, with attention paid to: <ul style="list-style-type: none"> a. Earth and seismic loading b. Structure foundations (type, size, depth, support of excavation, instrumentation, and testing) c. Retaining walls (type, height, depth, bracing, support of excavation, instrumentation, and testing) d. Tunnels & shafts (baselines, geologic profile, support of excavation, groundwater control, instrumentation, and testing) e. Embankments and fills (subgrade preparation, materials, compaction, instrumentation, and testing) f. Cut and natural slopes (inclination, sequence, and instrumentation) etc. 	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline specifications	

G. Quantities:

ACTION	Y/N
1. NA	

EP-03 CHECKLIST: GEOTECHNICAL – PRELIMINARY ENGINEERING (30%) (for Design-Bid-Build)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted	
2. Geotechnical investigation work plan has been submitted, reviewed, and approved	
3. Prepare draft of right of entry requests for geotechnical investigations	
4. Identify permits required for geotechnical investigations.	
5. Preliminary Level Geotechnical Report (stamped and sealed) have been submitted, reviewed, and approved (tailor following content to the project needs and scope).	
a. Cover Page citing structure name, number, stationing, design milestone, and date	
b. Table of contents	
c. Description of project scope/purpose	
d. Summary of design criteria (RM, AASHTO, IBC, etc.)	
e. Summary of office research/literature review	
f. Description of geologic setting	
g. Description of seismic setting (regional tectonics, significant historic earthquakes, proximate faults and degree of activity)	
h. Geotechnical and geologic hazards (ground shaking, fault rupture, tsunami/seiche, liquefaction and related phenomena (lateral spreading), landslides/slope instability, subsidence, subsurface gases), evaluated and mitigation strategies assessed	
i. Complete sufficient geotechnical investigations to advance the preferred alternative to the PE level and to support completion of explorations by end of Phase V (60% design).	
j. Investigations in support of the FEIS (Final Environmental Impact Statement) completed and results incorporated into the FEIS.	
k. Description of soil and rock conditions	
l. Description of groundwater conditions and submittal of groundwater level reading	
m. Geotechnical risks are included with appropriate weighting in the risk ledger at PE level.	
n. Cost estimate reflects geotechnical risk associated with the proposed project element at PE level	
o. Summary of laboratory testing	
p. Summary of hydraulic conditions affecting foundation recommendations	
q. PE investigations, laboratory testing, boring logs, and PE level geologic profile complete.	
r. Seismic analysis and evaluation (MDE/ODE/MCE spectral values and Site Class; liquefaction triggering. Probabilistic seismic hazard analysis (PSHA)	

	and preliminary acceleration time history analysis (for long-span bridge only. See Long Span Guideway Structure Checklist for the definition of long span bridge.)	
s.	Recommendations for structure foundations and track support with preliminary design complete.	
t.	Pile foundation recommendations (types; sizes; nominal axial resistance vs. depth; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev)	
u.	Drilled shaft foundation recommendations (types, sizes, rock socket lengths; nominal axial resistance vs. depth/elev; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev)	
v.	Spread footing foundation recommendations (description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity, coefficient of base friction)	
w.	Recommended retaining wall types identified (summary of wall types; description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability, sliding, and overturning checks; earth pressure recommendations and diagrams; earth anchor capacity) with preliminary design complete.	
x.	Recommendation for underground structures excavation, dewatering and support method(s).	
y.	Earthwork recommendations (maximum cut/fill slopes)	
z.	Slope stability recommendations (minimum factor of safety requirements in static and seismic condition; minimum retention requirements)	
aa.	Stormwater quality facility requirements (recommended basin elevation, infiltration testing method and parameters)	
bb.	Identify critical right-of-entry and permits necessary for future phases of the work.	
cc.	Identify potential Low-Impact-Development (LID) locations	
dd.	Feasible construction methods identified.	
ee.	Summarize geotechnical risk and provide recommendations for Final Design (FD) level investigations and analyses to address risks; include in risk register.	
ff.	Ground improvement recommendations (types, locations)	
gg.	Geotechnical instrumentation recommendations (types, locations)	

hh. Construction issues and recommendations (subsurface obstructions; support-of-excavation; sensitive adjacent structure; groundwater control; grout control/fluid loss)	
ii. Appendix – vicinity map	
jj. Appendix – exploration location plan	
kk. Appendix – exploration logs	
ll. Appendix – in-situ testing results	
mm. Appendix – site photographs	
nn. Appendix – rock core photographs	
oo. Appendix – others as needed	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. NA	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete.	
2. Interdisciplinary review included: Geotechnical review of non-geotechnical plans and specifications, with attention paid to: <ul style="list-style-type: none"> a. Earth and seismic loading b. Structure foundations (type, size, depth, support of excavation, instrumentation, and testing) c. Retaining walls (type, height, depth, bracing, support of excavation, instrumentation, and testing) d. Tunnels & shafts (baselines, geologic profile, support of excavation, groundwater control, instrumentation, and testing) e. Embankments and fills (subgrade preparation, materials, compaction, instrumentation, and testing) f. Cut and natural slopes (inclination, sequence, and instrumentation) etc. 	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline specifications	

G. Quantities:

ACTION	Y/N
1. NA	

EP-03 CHECKLIST: GEOTECHNICAL – FINAL DESIGN (60%) (for Design-Build)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been updated.	
2. Complete Final Geotechnical reports (stamped but unsigned acceptable) for Final Alignment (tailor following content to the project needs and scope), and it must meet the minimum field investigation in Requirements Manual (STRM) SET 701.	
a. Cover Page citing structure name, number, stationing, design milestone, and date	
b. Table of contents	
c. Description of project scope/purpose	
d. Summary of design criteria (RM, AASHTO, IBC, etc.)	
e. Summary of office research/literature review	
f. Description of geologic setting	
g. Subsurface profile complete	
h. Geotechnical design and recommendations substantially complete.	
i. Calculations substantially complete and submitted (stamped, unsigned acceptable).	
j. Description of seismic setting (regional tectonics, significant historic earthquakes, proximate faults and degree of activity)	
k. Description of geotechnical and geologic hazards (ground shaking, fault rupture, tsunami/seiche, liquefaction and related phenomena (lateral spreading), landslides/slope instability, subsidence, subsurface gases), and mitigation strategies assessed	
l. Complete geotechnical investigations, laboratory and in-situ testing to meet minimum field investigation requirements in STRM for Final Alignment.	
m. Boring logs, laboratory testing results, and geologic profile complete for Final Design.	
n. Mitigation of geologic and geotechnical hazards evaluated and design substantially complete.	
o. Major facility foundation designs, including but not limited to, elevated guideway, complete.	
p. Description of soil and rock conditions	
q. Description of groundwater conditions	
r. Summary of laboratory testing	
s. Summary of hydraulic conditions affecting foundation recommendations	

t. Seismic analysis and evaluation (MDE/ODE/MCE spectral values and Site Class; liquefaction triggering, settlement, stability, and lateral deformation estimates. Site response analysis (SRA) and final acceleration time history analysis as necessary (for long-span bridge only. See Long Span Guideway Structure Checklist for the definition of long span bridge.)	
u. Foundation and track support options discussion	
v. Pile foundation recommendations (types; sizes; materials; tip protection; nominal axial resistance vs. depth; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev; group factors; group settlement addressed; downdrag loads and load factors)	
w. Drilled shaft foundation recommendations (types, sizes, rock socket lengths; nominal axial resistance vs. depth/elev; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev; group factors; group settlement addressed; downdrag loads and load factors)	
x. Spread footing foundation recommendations (description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability check, coefficient of base friction)	
y. Retaining wall layout and design substantially complete; lateral earth pressures defined. Retaining wall recommendations (summary of wall types; description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability, sliding, and overturning checks; earth pressure recommendations and diagrams; earth anchor capacity, bond/load lengths)	
z. Earthwork recommendations (materials, gradation, placement, and compaction requirements; subgrade preparation requirements; maximum cut/fill slopes; benching requirements; erosion protection requirements)	
aa. Slope stability recommendations (minimum factor of safety requirements in static and seismic condition; minimum retention requirements; stability assessment, rockfall assessment; mitigation requirements; erosion protection requirements)	
bb. Stormwater quality facility requirements (recommended basin elevation, infiltration testing method and parameters)	
cc. Drainage recommendations, including, but not limited to, Low Impact Development (LID), and complete infiltration.	
dd. Ground improvement recommendations (types, limits of treatment)	

ee. Geotechnical instrumentation recommendations (types, locations)	
ff. Evaluate construction methods; identify constructability issues. (subsurface obstructions; support-of-excavation; sensitive adjacent structure; groundwater control; grout control/fluid loss)	
gg. Design for underground structures excavation, dewatering and support approach and complete layout including definition of major support elements.	
hh. Appendix – foundation data sheets	
ii. Appendix – vicinity map	
jj. Appendix – exploration location plan	
kk. Appendix – geologic profiles	
ll. Appendix – exploration logs	
mm. Appendix – in-situ testing results	
nn. Appendix – laboratory data sheets	
oo. Appendix – site photographs	
pp. Appendix – rock core stereonets	
qq. Appendix – rock core photographs	
rr. Appendix – others as needed	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations started- electronic submittal acceptable- unstamped.	
2. Calculations may include: foundation capacity, retaining wall stability, slope stability, settlement (total and differential), liquefaction settlement.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete.	
2. Interdisciplinary review included: Geotechnical review of non-geotechnical plans and specifications, with attention paid to:	

<ul style="list-style-type: none"> a. Earth and seismic loading b. Structure foundations (type, size, depth, support of excavation, instrumentation, and testing) c. Retaining walls (type, height, depth, bracing, support of excavation, instrumentation, and testing) d. Tunnels & shafts (baselines, geologic profile, support of excavation, groundwater control, instrumentation, and testing) e. Embankments and fills (subgrade preparation, materials, compaction, instrumentation, and testing) f. Cut and natural slopes (inclination, sequence, and instrumentation) 	
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Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Draft specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Geotechnical instrumentation drawings showing locations and types of geotechnical instrumentation. Geotechnical instrumentation drawings showing existing infrastructure to be monitored.	
2. Ground improvement drawings showing type and locations of ground improvement. Ground improvement drawings showing existing proximate infrastructure.	
3. Slope stabilization/rockfall protection drawings showing type and locations of slope stabilization/rockfall protection mitigations. Slope stabilization/rockfall protection drawings showing existing proximate infrastructure.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: GEOTECHNICAL – FINAL DESIGN (60%) (for Design-Bid-Build)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been updated.	
2. Draft Geotechnical reports (stamped but unsigned acceptable) have been submitted, reviewed, and approved (tailor following content to the project needs and scope), and it must meet the minimum field investigation in Requirements Manual (STRM) SET 701.	
a. Cover Page citing structure name, number, stationing, design milestone, and date	
b. Table of contents	
c. Description of project scope/purpose	
d. Summary of design criteria (DCM, AASHTO, IBC, etc.)	
e. Summary of office research/literature review	
f. Description of geologic setting	
g. Subsurface profile complete	
h. Geotechnical design and recommendations substantially complete.	
i. Calculations substantially complete and submitted (stamped, unsigned acceptable).	
j. Description of seismic setting (regional tectonics, significant historic earthquakes, proximate faults and degree of activity)	
k. Description of geotechnical and geologic hazards (ground shaking, fault rupture, tsunami/seiche, liquefaction and related phenomena (lateral spreading), landslides/slope instability, subsidence, subsurface gases), and mitigation strategies assessed	
l. Complete geotechnical investigations, laboratory and in-situ testing to meet minimum field investigation requirements in STRM for Final Alignment.	
m. Boring logs, laboratory testing results, and geologic profile complete for Final Design.	
n. Mitigation of geologic and geotechnical hazards evaluated and design substantially complete.	
o. Major facility foundation designs, including but not limited to, elevated guideway, complete.	
p. Description of soil and rock conditions	
q. Description of groundwater conditions	
r. Summary of laboratory testing	
s. Summary of hydraulic conditions affecting foundation recommendations	
t. Seismic analysis and evaluation (MDE/ODE/MCE spectral values and Site Class; liquefaction triggering, settlement, stability, and lateral deformation estimates. Site response analysis (SRA) and final acceleration	

	time history analysis as necessary (for long span bridge only. See Long Span Guideway Structure Checklist for the definition of long span bridge.)	
u.	Foundation and track support options discussion	
v.	Pile foundation recommendations (types; sizes; materials; tip protection; nominal axial resistance vs. depth; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev; group factors; group settlement addressed; downdrag loads and load factors)	
w.	Drilled shaft foundation recommendations (types, sizes, rock socket lengths; nominal axial resistance vs. depth/elev; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev; group factors; group settlement addressed; downdrag loads and load factors)	
x.	Spread footing foundation recommendations (description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability check, coefficient of base friction)	
y.	Retaining wall layout and design substantially complete; lateral earth pressures defined. Retaining wall recommendations (summary of wall types; description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability, sliding, and overturning checks; earth pressure recommendations and diagrams; earth anchor capacity, bond/load lengths)	
z.	Earthwork recommendations (materials, gradation, placement, and compaction requirements; subgrade preparation requirements; maximum cut/fill slopes; benching requirements; erosion protection requirements)	
aa.	Slope stability recommendations (minimum factor of safety requirements in static and seismic condition; minimum retention requirements; stability assessment, rockfall assessment; mitigation requirements; erosion protection requirements)	
bb.	Stormwater quality facility requirements (recommended basin elevation, infiltration testing method and parameters)	
cc.	Drainage recommendations, including, but not limited to, Low Impact Development (LID), and complete infiltration.	
dd.	Ground improvement recommendations (types, limits of treatment)	
ee.	Geotechnical instrumentation recommendations (types, locations)	

ff. Evaluate construction methods; identify constructability issues. (subsurface obstructions; support-of-excavation; sensitive adjacent structure; groundwater control; grout control/fluid loss)	
gg. Design for underground structures excavation, dewatering and support approach and complete layout including definition of major support elements.	
hh. Appendix – foundation data sheets	
ii. Appendix – vicinity map	
jj. Appendix – exploration location plan	
kk. Appendix – geologic profiles	
ll. Appendix – exploration logs	
mm. Appendix – in-situ testing results	
nn. Appendix – laboratory data sheets	
oo. Appendix – site photographs	
pp. Appendix – rock core stereonets	
qq. Appendix – rock core photographs	
rr. Appendix – others as needed	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations started- electronic submittal acceptable- unstamped.	
2. Calculations may include: foundation capacity, retaining wall stability, slope stability, settlement (total and differential), liquefaction settlement.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete.	
2. Interdisciplinary review included: Geotechnical review of non-geotechnical plans and specifications, with attention paid to: a. Earth and seismic loading	

<ul style="list-style-type: none"> b. Structure foundations (type, size, depth, support of excavation, instrumentation, and testing) c. Retaining walls (type, height, depth, bracing, support of excavation, instrumentation, and testing) d. Tunnels & shafts (baselines, geologic profile, support of excavation, groundwater control, instrumentation, and testing) e. Embankments and fills (subgrade preparation, materials, compaction, instrumentation, and testing) f. Cut and natural slopes (inclination, sequence, and instrumentation) 	
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Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Draft specifications developed	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Geotechnical instrumentation drawings showing locations and types of geotechnical instrumentation. Geotechnical instrumentation drawings showing existing infrastructure to be monitored.	
2. Ground improvement drawings showing type and locations of ground improvement. Ground improvement drawings showing existing proximate infrastructure.	
3. Slope stabilization/rockfall protection drawings showing type and locations of slope stabilization/rockfall protection mitigations. Slope stabilization/rockfall protection drawings showing existing proximate infrastructure.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities:

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: GEOTECHNICAL – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo final.	
2. Final Geotechnical reports (Stamped and sealed) (tailor following content to the project needs and scope).	
a. Cover Page citing structure name, number, stationing, design milestone, and date	
b. Table of contents	
c. Description of project scope/purpose	
d. Summary of design criteria (STRM, AASHTO, IBC, etc.)	
e. Summary of office research/literature review	
f. Description of geologic setting	
g. Subsurface profile complete	
h. Description of seismic setting (regional tectonics, significant historic earthquakes, proximate faults and degree of activity)	
i. Description of geotechnical and geologic hazards (ground shaking, fault rupture, tsunami/seiche, liquefaction and related phenomena (lateral spreading), landslides/slope instability, subsidence, subsurface gases), and mitigation strategies assessed	
j. Summary of subsurface exploration, laboratory and in-situ testing to meet the minimum field investigation requirements in DCM	
k. Description of soil and rock conditions	
l. Description of groundwater conditions	
m. Summary of laboratory testing	
n. Summary of hydraulic conditions affecting foundation recommendations, and submittal of final groundwater reading	
o. Seismic analysis and evaluation (MDE/ODE/MCE spectral values and Site Class; liquefaction triggering, settlement, stability, and lateral deformation estimates; liquefaction mitigation type and extent)	
p. Foundation and track support options discussion	
q. Pile foundation recommendations (types; sizes; materials; tip protection; nominal axial resistance vs. depth; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength, serviceability, and extreme limit states vs. depth/elev; group factors; group settlement addressed; downdrag loads and load factors; driving criteria and drivability analysis; static or dynamic testing requirements)	
r. Drilled shaft foundation recommendations (types, sizes, rock socket lengths; nominal axial resistance vs. depth/elev; resistance factors; factored axial resistance for strength, serviceability, and extreme limit states vs. depth/elev; lateral resistance parameters for strength,	

serviceability, and extreme limit states vs. depth/elev; group factors; group settlement addressed; downdrag loads and load factors; static or dynamic testing requirements)	
s. Spread footing foundation recommendations (description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability check, coefficient of base friction)	
t. Retaining wall recommendations (summary of wall types; description and properties of bearing strata; nominal bearing resistance vs. effective footing width; nominal bearing resistance of a given settlement (service limit state); resistance factors; factored bearing resistance for strength and extreme limit states; maximum elevation for base of footing; soil parameters for sliding and eccentricity; overall stability, sliding, and overturning checks; earth pressure recommendations and diagrams; earth anchor capacity, bond/load lengths, and testing requirements)	
u. Earthwork recommendations (materials, gradation, placement, and compaction requirements; subgrade preparation requirements; maximum cut/fill slopes; benching requirements; erosion protection requirements; instrumentation and monitoring requirements)	
v. Slope stability recommendations (minimum factor of safety requirements in static and seismic condition; minimum retention requirements; stability assessment, rockfall assessment; mitigation requirements; erosion protection requirements; instrumentation and monitoring requirements)	
w. Stormwater quality facility requirements (recommended basin elevation, infiltration testing method and parameters)	
x. Ground improvement recommendations (types, limits of treatment, design requirements)	
y. Geotechnical instrumentation recommendations (types, locations, monitoring frequency)	
z. Final groundwater level reading submitted.	
aa. Construction issues and recommendations (subsurface obstructions; limited headroom/clearance; vibration effects; support-of-excavation; groundwater control; grout control/fluid loss; sensitive adjacent structures & instrumentation requirements)	
bb. Appendix – foundation data sheets	
cc. Appendix – vicinity map	
dd. Appendix – exploration location plan	
ee. Appendix – geologic profiles	
ff. Appendix – exploration logs	
gg. Appendix – in-situ testing results	
hh. Appendix – laboratory data sheets	
ii. Appendix – site photographs	
jj. Appendix – rock core stereonet	
kk. Appendix – rock core photographs	
ll. Appendix – foundation capacity calculations	

mm. Appendix – retaining wall and slope stability calculations	
nn. Appendix – settlement calculations	
oo. Appendix – others as needed	
3. Draft Geotechnical Baseline Report (stamped unsigned acceptable) (only if required for DBB project)	

List all approved Requests for Deviation, if any:

List Technical memoranda, if any:

C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted (stamped and sealed).	
2. Calculations include: foundation capacity, retaining wall stability, slope stability, settlement (total and differential), liquefaction settlement.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete.	
2. Interdisciplinary review included: Geotechnical review of non-geotechnical plans and specifications, with attention paid to: <ul style="list-style-type: none"> a. Earth and seismic loading b. Structure foundations (type, size, depth, support of excavation, instrumentation, and testing) c. Retaining walls (type, height, depth, bracing, support of excavation, instrumentation, and testing) d. Tunnels & shafts (baselines, geologic profile, support of excavation, groundwater control, instrumentation, and testing) e. Embankments and fills (subgrade preparation, materials, compaction, instrumentation, and testing) f. Cut and natural slopes (inclination, sequence, and instrumentation) 	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings. It shall be signed and sealed for DB projects.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are complete Include legend of abbreviations and symbols	
2. Key plans and general arrangement plans are complete, fully annotated, and referenced	
3. Geotechnical instrumentation drawings show locations, types, and details of geotechnical instrumentation. Geotechnical instrumentation drawings show existing infrastructure to be monitored.	
4. Ground improvement drawings show type, locations, depth, extent, sequencing, and details of ground improvement. Ground improvement drawings show existing proximate infrastructure.	
5. Slope stabilization/rockfall protection drawings show type, locations, depth, extent, sequencing, and details of slope stabilization/rockfall protection mitigations. Slope stabilization/rockfall protection drawings show existing proximate infrastructure.	
6. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: GUIDEWAY STRUCTURAL – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Memo has been drafted and includes all code references identifying applicable version and year. Includes requirements by appropriate AHJs. (Final accepted if Design-Build) Identifies the Earthquake Resisting System.	
2. Technical memoranda have been identified and started.	
3. Document compliance with WSDOT “Structural Submittal Expectations Matrix” for Geometric Design Review.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

<ol style="list-style-type: none"> 1. Structural input on environmental documentation and permits 2. Peer Review plan for review of: <ol style="list-style-type: none"> a. Seismic design approach and method. b. Seismic hazard parameters (See EP-03 Geotechnical Checklist) c. Foundation in-ground plastic hinging design

C. Calculations:

ACTION	Y/N
1. Provide Table of Contents	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified	
2. Review for viable construction method and schedule	
3. Impacts to public and traffic ROW identified	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination issues with other disciplines identified.	
2. Interdisciplinary coordination initiated with other disciplines. Critical issues identified primarily related to architecture, systems, trackwork, drainage, utilities, construction sequence, and maintenance of traffic.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline Project Specifications Index	
2. Project Specific Prescriptive Specifications Developed and Part 2 Products (for Design-Build)	
3. Draft Construction Submittal list (for Design-Build)	

G. Quantities:

ACTION	Y/N
1. Not applicable	

H. Drawings:

BRIDGE

ACTION	Y/N
1. Preliminary Drawing List	
2. Preliminary Symbols and Abbreviations, and Legend Sheets.	
3. General notes shall identify: <ul style="list-style-type: none"> a. Applicable design codes, criteria, and project requirements. b. Geotechnical parameters and seismic criteria, c. Specified material properties for strength, stiffness, and density. 	
4. Show demolition limits	
5. Foundation layout sheet showing preliminary plan with dimensions.	
6. Abutment plan, elevation, and section sheets showing preliminary plan layout with dimensions.	
7. Intermediate pier plan, elevation, and sections sheets showing preliminary plan layout with dimensions.	
8. Framing plans showing preliminary plan layout geometry with dimensions.	
9. Superstructure plan and typical section sheets showing preliminary plan layout with dimensions.	
10. Main structural element (Girders, slabs, box girders, etc.) sheets showing members and dimensions.	
11. Bearing and expansion joint type and location identified.	
12. Traction power structures (OCS supports) located with dimensions.	
13. Barrier, curb, and railings located and identified.	
14. Transition or approach slabs identified.	

WALLS

ACTION	Y/N
1. Preliminary Symbols, Abbreviations, General Notes, and Typical Details.	
2. General notes sheet started identifying applicable design codes and criteria, material properties, design loading, seismic design parameters, performance criteria.	
3. Wall layout sheets show plan location, type, section, and elevation.	

4. Wall drainage system details identified.	
5. Secondary elements (barriers, guards, fencing, attachments) identified with dimensions.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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EP-03 CHECKLIST: GUIDEWAY STRUCTURAL – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Memo has been updated.	
2. Technical memoranda have been updated.	
3. Document compliance with WSDOT “Structural Submittal Expectations Matrix” for Constructability Review.	

List all Requests for Deviation including approval status:

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List Technical Memoranda, if any:

1. Preliminary Peer review report and progress for: a. Seismic direct displacement-based design method b. Nonlinear time history analysis method c. Foundation in-ground plastic hinging design
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C. Calculations:

ACTION	Y/N
1. Table of Contents updated	
2. Structural analysis summaries and design calculations submitted to support sizing of main structural elements in the superstructure, substructure, and foundations. Calculations may be unstamped.	
3. Preliminary design summaries of secondary structural elements and connections.	

D. Constructability

ACTION	Y/N
1. Constructability issue resolution developed.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination issues with other disciplines identified.	
2. Interdisciplinary coordination continued with other disciplines. Critical issues identified primarily related to architecture, systems, trackwork, drainage, utilities, construction sequence, safety, security, maintenance, and maintenance of traffic.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Draft Specifications for all project elements of work developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	
3. Draft Construction Submittal list	
4. Letter of Concurrence on Consultant signed/stamped Divisions 01 Specifications (for Design-Build)	

List any modification requests for ST Standard Specifications:

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G. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

H. Drawings:

BRIDGE

ACTION	Y/N
1. Updated Drawing List	
2. Symbols, Abbreviations, and Legend Sheets have been developed.	
3. Key plans and general arrangement plans.	
4. General notes developed identifying: <ul style="list-style-type: none"> a. Applicable design codes, criteria and project criteria b. Material properties c. Design loading d. References e. Seismic design parameters f. Geotechnical parameters including earth pressure diagrams g. Rail-structure interaction parameters h. Performance criteria i. Construction and/or fabrication requirements and limitations. 	
5. Demolition Plans	
6. Foundation layout sheets including location and sizing of foundation elements complete.	
7. Foundation detail sheets show primary member preliminary sizes and dimensions with main reinforcement diagrammatically shown.	
8. Foundation details sheets show seismic resisting system details.	
9. Abutment plan, elevation, and section sheets show preliminary member sizing and dimensions with main reinforcement shown.	
10. Intermediate pier plan, elevation, and sections show preliminary member sizing and dimensions with main reinforcement diagrammatically shown.	

11. Abutment and intermediate details shown and dimensioned without reinforcement.	
12. Framing plans are developed with typical dimensions and preliminary member sizes.	
13. Superstructure plan and section sheets show preliminary member sizes and dimensions with main reinforcement diagrammatically shown.	
14. Superstructure details shown with preliminary sizes and dimensions without reinforcement.	
15. Main structural element (Girders, slabs, box girders, etc.) sheets show preliminary member sizes and dimensions with main reinforcement and post-tensioning diagrammatically shown.	
16. Diaphragm and secondary structure details shown with preliminary sizes and dimensions without reinforcement.	
17. Bearing and expansion joint details shown with preliminary sizes and dimensions.	
18. Drainage, guideway supported utilities (including systems ductbanks), and signage details shown with preliminary sizes and dimensions with main reinforcement diagrammatically shown.	
19. Traction power structures (OCS supports) details shown with preliminary sizes and dimensions with main reinforcement diagrammatically shown.	
20. Stray current mitigation elements shown.	
21. Barrier, curb, and railing sheets show preliminary sizes and dimensions without reinforcement shown.	
22. Transition or approach slab sheets shown with preliminary sizes and dimensions without reinforcement.	
23. Maintenance and safety elements and attachments shown	
24. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

WALLS

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been developed.	
2. Key plans and general arrangement plans have been started.	
3. General notes developed identifying: <ul style="list-style-type: none"> a. Applicable design codes, criteria and project criteria b. Material properties c. Design loading d. References e. Seismic design parameters f. Geotechnical parameters including earth pressure diagrams g. Rail-structure interaction parameters h. Performance criteria i. Construction and/or fabrication requirements and limitations. 	
4. Wall layout sheets show preliminary alignment, plan location, type, section, and elevation.	
5. Wall detail sheets show preliminary member sizing and dimensions with main reinforcement diagrammatically shown.	
6. Wall penetrations shown with preliminary sizing and location.	
7. Expansion joint details shown with preliminary sizing and dimensions.	
8. Wall drainage system details shown with preliminary sizing and dimensions.	

9. Secondary elements (barriers, guards, fencing, attachments) shown with preliminary sizing and dimensions.	
10. Architectural element layout and details including surface finishes identified.	
11. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: GUIDEWAY STRUCTURAL – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo final.	
2. Technical memoranda have been submitted, reviewed, and approved by ST or their representatives.	
3. Document compliance with WSDOT “Structural Submittal Expectations Matrix” for PS&E Review Set.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

1. Final Peer review report complete and submitted.

C. Calculations:

ACTION	Y/N
1. Table of Contents finalized.	
2. Calculations complete and submitted with outstanding minor refinement and coordination that does not impact scope and schedule. Calculations substantially complete (Design-Build)	
3. Analysis and Calculations include applicable force effects on structural and non-structural items not identified for deferred design due to the loading conditions defined by code, including but not limited to permanent gravity loads, Seismic, Wind, Rail/Structure Interaction, imposed deformations or displacements, earth pressure, etc. Includes all transient gravity loads including LRV loading and all associated forces effects.	
4. Calculations include force effects on structural items resulting from Contractor means and methods of construction including erection, staging, and construction sequencing, as required.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	
2. Erection analysis performed and complete, as required.	

E. Interdisciplinary Coordination:

ACTION	Y/N

1. Interdisciplinary coordination with other disciplines is complete and includes structural penetrations by other disciplines with outstanding minor refinement and coordination that does not impact scope and schedule. Interdisciplinary coordination substantially complete (Design-Build).	
2. Critical issues finalized primarily related to architecture, systems, trackwork, drainage, utilities, construction sequence, safety, security, maintenance, and maintenance of traffic.	
3. Interdisciplinary review included: Structural review of non-structural specifications, with attention paid to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous 60% submittal resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings with outstanding minor refinement and coordination that does not impact scope and schedule. Specifications substantially complete (Design-Build)	
4. Construction Submittal list identifying submittals ST is responsible to review.	
5. Specifications are stamped and sealed (for Design-Build)	

List any modification requests for ST Standard Specifications:

G. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

H. Drawings:

BRIDGE

ACTION	Y/N
1. Finalization of all prior stage report requirements and implementation of prior design review comment resolutions from 30% and 60% submissions.	

2. Final complete Drawing List provided with outstanding minor refinement but describes estimate of detail sheets. Final Drawing list substantially complete (Design-Build)	
3. Symbols, Abbreviations, General Notes, and Typical Details are complete.	
4. Key plans and general arrangement plans are complete, fully annotated, and referenced.	
5. General notes are complete and identify all items required from the 30% and 60% submittals.	
6. Demolition plans and details finalized.	
7. Foundation layout sheets including location and sizing complete, dimensioned, fully annotated, and referenced.	
8. Foundation detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
9. Foundation details sheets showing seismic resisting system details are complete.	
10. Abutment plan, elevation, and section sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
11. Intermediate pier plan, elevation, and section sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
12. Abutment and intermediate detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
13. Framing plans are complete, dimensioned, fully annotated, and referenced.	
14. Superstructure plan and section sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
15. Superstructure detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
16. Main structural element (Girders, slabs, box girders, etc.) sheets are complete, dimensioned, fully annotated, referenced and include reinforcement and post-tensioning.	
17. Diaphragm and secondary structure detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
18. Bearing and expansion joint sheets are complete, dimensioned, fully annotated, and referenced.	
19. Drainage, guideway supported utilities (including systems ductbanks), and signage sheets including connections and attachments are complete, dimensioned, fully annotated, and referenced.	
20. Traction power structures (OCS supports) sheets including connections and attachments are complete, dimensioned, fully annotated, and referenced.	
21. Stray current mitigation measures completed.	
22. Barrier, curb, and railing sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
23. Transition or approach slab sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
24. Maintenance and safety elements and attachments complete.	
25. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

Note: Drawings may require minor refinement that does not impact scope and schedule.

WALLS

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are complete.	
2. Key plans and general arrangement plans are complete, fully annotated, and referenced.	
3. General notes are complete identify all items required from the 30% and 60% submittals.	
4. Wall layouts including alignment, plan location, type, section, and elevation complete. Layouts have been coordinated with other disciplines: Civil, Drainage, Landscape, Architecture, etc.	
5. Wall detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
6. Wall penetrations are located and detailed including reinforcement.	
7. Expansion joint details complete, dimensioned, fully annotated, and referenced.	
8. Wall drainage system details are complete, dimensioned, fully annotated and referenced.	
9. Secondary elements (barriers, guards, fencing, attachments) layout and detail sheets complete, dimensioned, fully annotated and referenced.	
10. Architectural element layout and detail sheets complete, dimensioned, fully annotated, and referenced. Architectural surface finish details complete and dimensioned.	
11. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

Note: Drawings may require minor refinement that does not impact scope and schedule. Drawings substantially complete (Design-Build)

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: LANDSCAPE– PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

Codes and Standards:

ACTION	Y/N
1. Basis of Design memo has been drafted. (Final accepted if Design-Build)	
2. Produce code compliance summary sheet, including but not limited to applicable codes, landscape required, and replacement planting requirements per jurisdiction	
3. Determine sustainable elements as part of the PE Sustainability review	
4. Obtain from ST existing LOCs early in the 30% design phase and incorporate into code compliance summary sheet	
5. Determine and pursue any additional LOCs with ST and incorporate into code compliance summary sheet	

List proposed Requests for Deviation, if any:

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Passenger Experience:

ACTION	Y/N
1. Evaluate design changes impacting passenger experience as outlined in the SEDG	
2. Perform Persona Workshop as outlined in the SEDG and document results	
3. Produce Evaluation Matrix as outlined in the SEDG	
4. Produce Passenger Experience Expectation Management Plan for proposed deviations	
5. (For DB) Update Design Decision Log to reflect new or updated passenger experience-related design decisions	

Sustainability:

ACTION	Y/N
1. Determine which sustainability certification system will be pursued, and any resulting design implications	
2. Follow certification-specific documentation process	

General:

ACTION	Y/N
1. Produce design narrative for Basis of Design memo	
2. Review proposed limits of planting areas with ST	

C. Interdisciplinary Coordination:

ACTION	Y/N

1. Coordinate with Civil, and incorporate clearances for conceptual landscape schemes in drawings	
2. Coordinate with Architectural, and ensure architectural plans account for conceptual landscape design	
3. Coordinate landscape plans with all disciplines	

Description of interdisciplinary coordination efforts:

--

D. Specifications:

ACTION	Y/N
1. Outline specifications	

List Landscape Architectural Specifications:

<ol style="list-style-type: none"> 1. Temporary Tree Protection 2. Tree & Shrub Removal 3. Irrigation Systems 4. Soil Preparation 5. Landscape Planting 6. Seeding 7. Hydroseeding for Erosion Control 8. Landscape Maintenance

E. Drawings:

Site Plans

ACTION	Y/N
1. Site plan with general dimensions of hardscape and planting areas shown	
2. Proposed landscape areas sized and located on site plans, including which areas will receive irrigation and which jurisdiction will maintain the areas.	
3. Type and quantity of parking lot landscaping where surface parking facilities have been determined	
4. Extent of landscape illustrated and coordinated with Civil and Electrical	
5. Circulation diagrams incorporated into landscape design	
6. Extent of property lines and required setbacks illustrated on site plans	

Elevations and Sections

ACTION	Y/N
1. Landscape elevations at a schematic level	

Enlarged Plans

ACTION	Y/N

1. Enlarged plans with key elements shown: general tree canopy size based on DCM requirements or ST design direction, pedestrian amenities, benches, kiosks, and light poles	
2. Preliminary layouts of trails or ancillary pedestrian circulation routes	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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F. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: LANDSCAPE– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

Codes and Standards:

ACTION	Y/N
1. Basis of Design memo updated	
2. Update code compliance summary sheet, including but not limited to applicable codes	
3. Complete Accessibility Design Review Checklist	
4. Confirm potential additional LOCs have been accepted by AHJ, and incorporate into code compliance summary sheet	

List proposed Requests for Deviation, if any:

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Passenger Experience:

ACTION	Y/N
1. Evaluate design changes impacting passenger experience as outlined in the SEDG	
2. Update Evaluation Matrix from the SEDG to reflect new or updated passenger experience-related design decisions	
3. Re-perform the Persona Workshop if metric(s) in the Evaluation Matrix are rated 'Does Not Satisfy Guidelines'	
4. Update Persona Workshop Action Log if the Persona Workshop is re-performed	
5. (For DB) Update Design Decision Log to reflect new or updated passenger experience-related design decisions	
6. Produce new or updated Passenger Experience Expectation Management Plan for proposed deviations	

Sustainability:

ACTION	Y/N
1. Follow certification-specific documentation process	
2. Integrate sustainability-based decisions into drawing set	
3. Coordinate material selection with certification requirements and credits being pursued	

General:

ACTION	Y/N

1. Update landscape architecture and urban design to include decisions made at 30% design based on relevant concurrence and agreements	
2. Review landscape and irrigation plans with ST	
3. Review maintenance and access strategies with ST	

C. Interdisciplinary Coordination:

ACTION	Y/N
1. Civil, electrical, and irrigation systems equipment selection coordinated for location and sizing of sleeves and pipes	
2. Design fully coordinated with locations and sizes of Electrical elements	
3. Horizontal and vertical dimensional controls established, coordinated with Civil, and indicated on drawings	
4. Tree canopy layouts coordinated with Electrical, and lighting calculations produced by Electrical	
5. Coordinate finish grade at plaza areas with Civil	
6. Hardscape elements coordinated with Architectural, and shown on drawings	
7. Confirm landscape plans are consistent with ST Requirements Manual	
8. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

Description of interdisciplinary coordination efforts:

D. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings	
2. Requests for modification of the ST Standard Specifications submitted	
3. Species, size, and quantity of plants indicated	
4. All materials selections coordinated with drawings	
5. Irrigation material and equipment cut sheets provided	
6. For projects pursuing sustainability certifications, coordinate material selection with certification requirements and credits being pursued	

List any modification requests for ST Standard Specifications:

E. Drawings:

General:

ACTION	Y/N
1. All material selections shown on drawings and coordinated with specifications	

Site Plans:

ACTION	Y/N
1. Site plan with specific dimensions and all programs shown	

2. Extent of landscape areas shown, dimensioned, and coordinated with Civil	
3. Layout of parking lot landscape	
4. Confirm extent of property lines and required setbacks illustrated on site plans	
5. Location of temporary and permanent irrigation indicated	
6. All above ground utilities located and shown	
7. Code compliance demonstrated	
8. Sections of site design developed with dimensions that demonstrate key grade change conditions	
9. Key plan produced; sectors coordinated with all disciplines	
10. Circulation diagrams incorporated into landscape plans	

Planting Plans:

ACTION	Y/N
1. Planting plan layouts including species, size, quantity, spacing, and notes as needed.	
2. Location of vegetative clear zones shown	
3. Locations of fences, mow strips, and other above-ground elements in landscape areas	

Elevations and Sections:

ACTION	Y/N
1. Landscape elevations at scale to show work	
2. Landscape sections at scale to show work	

Enlarged Plans and Details:

ACTION	Y/N
1. Enlarged plans with key elements shown: general tree canopy size based on DCM requirements or ST design direction, pedestrian amenities, benches, kiosks, and light poles	
2. Developed layouts of trails or ancillary pedestrian circulation routes	

Schedules:

ACTION	Y/N
1. Plant Schedule provided	
2. Regulatory and Code requirements identified	

Provide notes on the implementation of ST Standard or Guidance Drawings:

F. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings	
2. Quantities provided to Project Manager for ICE development / update	

EP-03 CHECKLIST: LANDSCAPE– FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

Codes and Standards:

ACTION	Y/N
1. Basis of Design memo final	
2. Finalize code compliance summary sheet, including but not limited to applicable codes, landscape required, and replacement planting requirements per jurisdiction	
3. Finalize Accessibility Design Review Checklist	
4. Confirm potential additional LOCs have been accepted by AHJ, and incorporate into code compliance summary sheet	

List all approved Requests for Deviation, if any:

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Passenger Experience:

ACTION	Y/N
1. Evaluate design changes impacting passenger experience as outlined in the SEDG	
2. Update Evaluation Matrix from the SEDG to reflect new or updated passenger experience-related design decisions	
3. Re-perform the Persona Workshop if metric(s) in the Evaluation Matrix are rated 'Does Not Satisfy Guidelines'	
4. Update Persona Workshop Action Log if the Persona Workshop is re-performed	
5. (For DB) Update Design Decision Log to reflect new or updated passenger experience-related design decisions	
6. Produce new or updated Passenger Experience Expectation Management Plan for proposed deviations	

Sustainability:

ACTION	Y/N
1. Follow certification-specific documentation process	
2. Fully integrate sustainability-based decisions into drawing set	
3. Confirm material selection has been coordinated with certification requirements and credits being pursued	

General:

ACTION	Y/N

1. Update landscape architecture and irrigation design to include decisions made at 60% design based on relevant concurrence and agreements	
2. All drawings and specifications complete and coordinated for constructability	

C. Interdisciplinary Coordination:

ACTION	Y/N
1. Final landscape and irrigation equipment coordinated with Civil and Architectural for final layout of landscape areas	
2. Confirm all Landscape Architectural details have been coordinated with Arcitectural and Civil details	
3. Confirm with Electrical, Mechanical, Systems, and Civil that conduit and pipe routing and sizing are coordinated and accounted for in drawings	
4. Horizontal and vertical dimensional controls finalized and coordinated with Civil	
5. Tree canopy layouts coordinated with Electrical, and lighting calculations produced by Electrical	
6. Finalize finish grade coordination with Civil at plaza areas	
7. Hardscape elements coordinated with Architectural, and shown on drawings	
8. Confirm landscape plans are consistent with ST Requirements Manual and other disciplines	
9. Perform constructability review	

Description of interdisciplinary coordination efforts:

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D. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	
4. All material selections finalized, indicated, and coordinated with drawings	
5. Review and coordinate landscape and irrigation specifications	
6. Confirm references to industry standards	
7. Confirm construction tolerances	
8. Material and equipment cut sheets provided	
9. For projects pursuing sustainability certifications, confirm material selection has been coordinated with certification requirements and credits being pursued	

E. Drawings:

General Guidelines for Drawings

ACTION	Y/N
1. All final material selections shown on drawings and coordinated with specifications	

Site Plans

ACTION	Y/N
1. Final site plan of station site with specific dimensions and all program elements shown	
2. Finalized extent of hardscape shown, dimensioned, and coordinated with Civil	
3. Final layout of parking lot landscaping	
4. Extent of property lines and required setbacks finalized on site plans	
5. Confirm all above ground utilities located and shown	
6. Confirm code compliance as applicable	
7. Sections of site design developed with dimensions that demonstrate key grade change conditions	
8. Final key plan; sectors coordinated with all disciplines	

Planting Plans:

ACTION	Y/N
1. Final planting plans including species, size, quantity, spacing, and notes as needed.	
2. Locations of fences, mow strips, and other above-ground elements in landscape areas	

Elevations and Sections:

ACTION	Y/N
1. Landscape elevations at increased scale to show work	
2. Landscape sections at increased scale to show work	
3. Horizontal and vertical dimensional control finalized on drawings	

Enlarged Plans and Details:

ACTION	Y/N
1. Final enlarged plans with key elements shown: tree canopy size based on DCM requirements or ST design direction, pedestrian amenities, benches, kiosks, and light poles	
2. Final layouts of trails or ancillary pedestrian circulation routes	
3. All details addressed and included	
4. ADA details complete for site related items	

Schedules:

ACTION	Y/N
1. Plant schedules finalized	
2. Regulatory and Code requirements finalized	

Provide notes on the implementation of ST Standard or Guidance Drawings:

F. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
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1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: LONG SPAN GUIDEWAY STRUCTURAL – PRELIMINARY ENGINEERING (30%)
Refer to Non-Conventional Bridges in Design Requirements Set 721 – Bridges and Elevated Structures

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Memo has been drafted and includes all code references identifying applicable version and year. Includes requirements by appropriate AHJs. Identifies the Earthquake Resisting System. (Final accepted if Design-Build)	
2. Technical memoranda have been identified and started:	
3. Document compliance with WSDOT “Structural Submittal Expectations Matrix” for Geometric Design Review	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

<ol style="list-style-type: none"> 1. Structural input on environmental documentation and permits 2. Material long-term sensitivity, durability, and serviceability studies 3. Wind Study: wind speed criterion with historical wind and climate data 4. Seismic design approach including: <ol style="list-style-type: none"> a. Seismic design criteria b. Seismic analysis method c. Seismic damage criteria for structural components to meet performance objectives d. In-Ground plastic hinging locations and preliminary properties e. Above-Ground plastic hinging or fusing mechanism locations and preliminary properties f. Preliminary Shock Transmission Unit locations and properties 5. Seismic hazard parameters (See EP-03 Geotechnical Checklist) 6. Preliminary life-cycle cost comparison 7. Preliminary deflection and vibration control to meet vibration requirements of Design Requirements Set 721 8. Preliminary location of rail expansion joints 9. Peer review plan for review of Item 4: <ol style="list-style-type: none"> a. Peer review complete for Item 5.

C. Calculations:

ACTION	Y/N
Provide Table of Contents	
1. Preliminary dead and live load modelling.	

2. Preliminary seismic demand / capacity checks on foundation elements including performance level checks to meet specified operational classification (typical, essential, critical) as stated in the Basis of Design	
3. Preliminary wind demand / capacity checks on foundation elements	
4. Preliminary deflection and vibration control to meet vibration requirements of Design Requirements Set 721. Analysis using LRV vehicle as a rigid body is permitted.	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified	
2. Preliminary construction sequencing for long spans.	
3. Review for viable construction method and schedule.	
4. Impacts to public and traffic ROW identified	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination issues with other disciplines identified.	
2. Interdisciplinary coordination initiated with other disciplines. Critical issues identified primarily related to architecture, systems, trackwork, drainage, utilities, construction sequence, and maintenance of traffic.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline Project Specifications Index	
2. Project Structural Specifications related to long-span bridges developed (for Design-Build)	
3. Draft Construction Submittal list (for Design-Build)	

G. Quantities:

ACTION	Y/N
1. Not applicable	

H. Drawings:

BRIDGE

ACTION	Y/N
1. Preliminary Drawing List	
2. Preliminary Symbols and Abbreviations, and Legend Sheets.	
3. General notes shall identify: <ul style="list-style-type: none"> a. Applicable design codes, criteria, and project requirements. 	

b. Geotechnical parameters and seismic criteria, c. Specified material properties for strength, stiffness, and density.	
4. General Notes: Design Criteria: Provide Complete structural design criteria as required by AASHTO codes for dead, live, wind, snow, seismic and other applicable load conditions. Additionally, provide all the following code based seismic information on the general notes: a. Risk Category, Importance Factors Ie b. Seismic Site Parameters Ss, S1, Fa, Fv, Sds, Sd1, Site Class, Seismic Design Category or description of alternate seismic design parameters c. Analysis procedure to be used.	
5. Show demolition limits	
6. Foundation Plans: a. Layout sheet showing preliminary plan with dimensions. b. Preliminary foundation elevations including embedment into soil. c. Identification of seismic resisting foundation elements.	
7. Abutment plan, elevation, and section sheets showing preliminary plan layout with dimensions.	
8. Intermediate pier plan, elevation, and sections sheets showing preliminary plan layout with dimensions.	
9. Framing plans showing preliminary plan layout geometry with dimensions.	
10. Superstructure plan and typical section sheets showing preliminary plan layout with dimensions.	
11. Main structural element (girders, pylons, slabs, stay cables, etc.) sheets showing members and dimensions.	
12. Bearing and expansion joint type and location identified.	
13. Traction power structures (OCS supports) located with dimensions.	
14. Barrier, curb, and railings located and identified.	
15. Transition or approach slabs identified.	

WALLS

ACTION	Y/N
1. See GUIDEWAY STRUCTURAL – PRELIMINARY ENGINEERING 30% - WALLS	

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: LONG SPAN GUIDEWAY STRUCTURAL – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD AND DESIGN-BID-BUILD)**

Refer to Non-Conventional Bridges in Design Requirements Set 721 – Bridges and Elevated Structures

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Memo has been updated.	
2. Technical memoranda have been updated.	
3. Document compliance with WSDOT “Structural Submittal Expectations Matrix” for Constructability Review	

List all Requests for Deviation including approval status:

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List Technical Memoranda, if any:

<ol style="list-style-type: none">1. Material long-term sensitivity, durability, and serviceability studies. If Type 1L cement will be used on long span post-tension members, start the creep test on the mix design unless ST standard spec. allows the use of Type 1L cement on long span post-tension members.2. Wind Study:<ol style="list-style-type: none">a. Sectional model testing and reportb. Wind tunnel analysis preliminary report, if necessaryc. Wind specialist qualifications3. Seismic design approach items listed in 30% checklist and the following:<ol style="list-style-type: none">a. Seismic analysis plan with QA/QC procedure and software validationb. Updated seismic hazards parameters based on updated geotechnical analysis (See EP-03 Geotechnical Checklist)c. Permanent instrumentation pland. Nonlinear time history analysis, if necessary4. Updated life-cycle cost comparison5. Updated deflection and vibration control to meet vibration requirements of Design Requirements Set 7216. Rail-structure interaction analysis7. Updated location of rail expansion joints8. Preliminary Peer review report and progress on Items 2, 3, 5 and 6.
--

C. Calculations:

ACTION	Y/N
1. Table of Contents updated	
2. Structural analysis summaries and design calculations submitted to support sizing and reinforcement of main structural elements in the superstructure, substructure, and foundations. Calculations may be unstamped.	
3. Preliminary design summaries of secondary structural elements and connections.	
4. Updated seismic demand / capacity checks on foundation elements including performance level checks to meet specified operational classification (typical, essential, critical) as stated in the Basis of Design	
5. Soil-structure interaction model analysis performed. Nonlinear Time History analysis performed if necessary.	
6. Preliminary design of seismic hinging mechanisms at design seismic events	
7. Updated wind demand / capacity checks on foundation elements	
8. Updated deflection and vibration control to meet vibration requirements of Design Requirements Set 721. Vibration modelling to be more developed and include rider comfort analysis.	
9. Rail-structure interaction checks for rail stress and rotation limits.	
10. Long-term deflection analysis performed including preliminary camber.	

D. Constructability

ACTION	Y/N
1. Constructability issue resolution developed.	
2. Preliminary erection analysis	
3. Preliminary bridge component (segmental girders, cable stays, etc.) dimensions and designation	
4. Temporary construction support structures shown	
5. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination issues with other disciplines identified	
2. Interdisciplinary coordination continued with other disciplines. Critical issues identified primarily related to architecture, systems, trackwork, drainage, utilities, construction sequence, safety, security, maintenance, and maintenance of traffic.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Draft Specifications for all project elements of work developed, refined, and coordinated with the drawings	
2. Requests for modification of the ST Standard Specifications submitted.	

3. Draft Construction Submittal list	
4. Letter of Concurrence on Consultant signed/stamped Divisions 01 Specifications (for Design-Build)	

List any modification requests for ST Standard Specifications:

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G. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

H. Drawings:

BRIDGE

ACTION	Y/N
1. Updated Drawing List	
2. Symbols, Abbreviations, and Legend Sheets have been developed.	
3. Key plans and general arrangement plans.	
4. General notes developed identifying: <ul style="list-style-type: none"> a. Applicable design codes, criteria and project criteria b. Material properties c. Design loading d. References e. Seismic design parameters f. Rail-structure interaction parameters g. Seismic performance and damage criteria h. Construction and/or fabrication requirements and limitations. 	
5. Demolition Plans	
6. Foundation Plans: <ul style="list-style-type: none"> a. Layout sheets including location and sizing of foundation elements complete. b. Foundation elevations including embedment into soil complete. c. Identification and developed seismic resisting foundation elements 	
7. Foundation detail sheets show primary member preliminary sizes and dimensions with main reinforcement diagrammatically shown.	
8. Foundation details sheets show seismic resisting system details.	
9. Abutment plan, elevation, and section sheets show member sizing and dimensions with main reinforcement shown.	
10. Intermediate pier plan, elevation, and sections show preliminary member sizing and dimensions with main reinforcement diagrammatically shown.	
11. Abutment and intermediate details shown and dimensioned without reinforcement.	
12. Framing plans are developed with typical dimensions and preliminary member sizes.	

13. Superstructure plan and section sheets show preliminary member sizes and dimensions with main reinforcement diagrammatically shown.	
14. Superstructure details shown with preliminary sizes and dimensions without reinforcement.	
15. Main structural element (girders, pylons, slabs, stay cables, etc.) sheets show preliminary member sizes and dimensions with main reinforcement and post-tensioning diagrammatically shown.	
16. Bridge component (segmental girder section, cable stays, etc.) schedule shown	
17. Diaphragm and secondary structure details shown with preliminary sizes and dimensions without reinforcement.	
18. Bearing and expansion joint details shown with preliminary sizes and dimensions.	
19. Drainage, guideway supported utilities (including systems ductbanks), and signage details shown with preliminary sizes and dimensions with main reinforcement diagrammatically shown.	
20. Traction power structures (OCS supports) details shown with preliminary sizes and dimensions with main reinforcement diagrammatically shown.	
21. Stray current mitigation elements shown.	
22. Barrier, curb, and railing sheets show preliminary sizes and dimensions without reinforcement shown.	
23. Transition or approach slab sheets shown with preliminary sizes and dimensions without reinforcement.	
24. Maintenance and safety elements and attachments complete.	
25. Shock Transmission Units or other force transmission components complete.	
26. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

WALLS

ACTION	Y/N
1. See GUIDEWAY STRUCTURAL – FINAL DESIGN 60% - WALLS	

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: LONG SPAN GUIDEWAY STRUCTURAL – FINAL DESIGN (90% and 100%)
Refer to Non-Conventional Bridges in Design Requirements Set 721 – Bridges and Elevated Structures

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo final.	
2. Technical memoranda have been finalized.	
3. Document compliance with WSDOT “Structural Submittal Expectations Matrix” for PS&E Review Set.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

<ol style="list-style-type: none"> Those memoranda required from 60% checklist have been submitted, reviewed, and approved by ST or their representatives. Final Peer review report complete and submitted.

C. Calculations:

ACTION	Y/N
1. Table of Contents finalized.	
2. Structural analysis summaries and design calculations finalized and submitted to support sizing of main structural elements in the superstructure, substructure, and foundations using all applicable load cases with outstanding minor refinement and coordination that does not impact scope and schedule.	
3. Analysis and Calculations include applicable force effects on structural and non-structural items not identified for deferred design due to the loading conditions defined by code, including but not limited to permanent gravity loads, Seismic, Wind, Rail/Structure Interaction, imposed deformations or displacements, earth pressure, etc. Includes all transient gravity loads including LRV loading and all associated forces effects.	
4. Design summaries of secondary structural elements and connections is complete.	
5. Soil-structure model interaction complete and results integrated into design.	
6. Design of seismic hinging mechanisms at design seismic events is complete	
7. Final wind demand / capacity checks on foundation elements	
8. Final deflection and vibration control analysis including rider comfort analysis.	
9. Final rail-structure interaction checks for rail stress and rotation limits.	
10. Long-term deflection analysis and final camber calculation.	

11. Calculations include force effects on structural items resulting from contractor means and methods of construction including erection, staging, and construction sequencing, as required.	
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D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	
2. Erection analysis finalized and complete	
3. Bridge component (segmental girders, cable stays, etc.) dimensions and designation complete	
4. Temporary construction support structures shown and detailed.	
5. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete and includes structural penetrations by other disciplines with outstanding minor refinement and coordination that does not impact scope and schedule.	
2. Critical issues finalized primarily related to architecture, systems, trackwork, drainage, utilities, construction sequence, safety, security, maintenance, and maintenance of traffic.	
3. Interdisciplinary review included: Structural review of non-structural specifications, with attention paid to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous 60% submittal resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings with outstanding minor refinement and coordination that does not impact scope and schedule.	
4. Construction Submittal list identifying submittals ST is responsible to review.	

List any modification requests for ST Standard Specifications:

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G. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

H. Drawings:

BRIDGE

ACTION	Y/N
1. Finalization of all prior stage report requirements and implementation of prior design review comment resolutions from 30% and 60% submissions.	
2. Final complete Drawing List provided with outstanding minor refinement but describes estimate of detail sheets.	
3. Symbols, Abbreviations, General Notes, and Typical Details are complete.	
4. Key plans and general arrangement plans are complete, fully annotated, and referenced.	
5. General notes are complete and identify all items required from the 30% and 60% submittals.	
6. Demolition plans and details finalized.	
7. Foundation plan sheets including location and sizing complete, dimensioned, fully annotated, and referenced. Includes complete information required from 60% submittal.	
8. Foundation detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
9. Foundation details sheets showing seismic resisting system details are complete.	
10. Abutment plan, elevation, and section sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
11. Intermediate pier plan, elevation, and section sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
12. Abutment and intermediate detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
13. Framing plans are complete, dimensioned, fully annotated, and referenced.	
14. Superstructure plan and section sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
15. Superstructure detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
16. Main structural element (Girders, slabs, box girders, etc.) sheets are complete, dimensioned, fully annotated, referenced and include reinforcement and post-tensioning.	
17. Bridge component (segmental girder section, cable stays, etc.) schedule complete	

18. Diaphragm and secondary structure detail sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
19. Bearing and expansion joint sheets are complete, dimensioned, fully annotated, and referenced.	
20. Drainage, guideway supported utilities (including systems ductbanks), and signage sheets including connections and attachments are complete, dimensioned, fully annotated, and referenced.	
21. Traction power structures (OCS supports) sheets including connections and attachments are complete, dimensioned, fully annotated, and referenced.	
22. Stray current mitigation measures completed.	
23. Barrier, curb, and railing sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
24. Transition or approach slab sheets are complete, dimensioned, fully annotated, referenced and include reinforcement.	
25. Maintenance and safety elements and attachments complete.	
26. Shock Transmission Units or other force transmission components shown	
27. Drawings are coordinated with the specifications: Terminology is consistent between the two documents Specified materials and products are consistent between the two documents	

Note: Drawings may require minor refinement that does not impact scope and schedule.

WALLS

ACTION	Y/N
1. See GUIDEWAY STRUCTURAL – FINAL DESIGN 60% - WALLS	

Note: Drawings may require minor refinement that does not impact scope and schedule.

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: MECHANICAL (HVAC and Plumbing) – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design report has been submitted with sufficient detail to define the strategy for HVAC and/or plumbing systems, including operational approach, indoor space temperature requirements, and ventilation strategy. The design memo shall reference all applicable codes and specific requirements including current ST Requirement Manual that support the design concept. All assumptions are to be stated including those preliminary requirements defined by the AHJ. Basis of Design Report including and not limited to an <ul style="list-style-type: none"> a. Introduction, b. Design strategy and systems description c. References d. Assumptions including operational approach and temperatures e. Code compliance and identification of areas of concern f. Identify any design elements that specifically mitigate hazards identified in Preliminary Hazard Assessments, g. Incorporation and highlight of Sustainability features identified in Sustainability checklist. 	
2. Technical memoranda or reports, if needed for providing detail to support design, identify a list have a minimum of 30% level drafts developed..	
3. Letters of Concurrence, if needed, have been identified in a list below.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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List Letters of Concurrence, if any:

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C. Calculations:

ACTION	Y/N
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1. Plumbing calculations for water service sizing.	
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D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	
2. Develop design and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination initiated with respective disciplines. Identify any issues that have arisen or information that is lacking in BOD.	
2. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ul style="list-style-type: none"> a. Point to Point responsibility diagrams are complete. b. Interface Block Diagrams drafted with Concept of Operations outlined. c. Identifies ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
3. Interfaces defined and coordinated: <ul style="list-style-type: none"> • Identify all utility connections, connection locations and preliminary sizing. • Preliminary mechanical equipment space proofing • Identify intake and exhaust locations • Preliminary electrical coordination of equipment power requirements including any special requirements. 	

List ICDs:

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F. Specifications:

ACTION	Y/N
1. Table of Contents for planned specifications, including designer furnished and ST standard specifications, and commissioning specifications.	
2. List of potential or planned Specification Modification Requests	

G. Drawings:

ACTION	Y/N
1. General drawings containing symbols, notes and code criteria outlined in the Design Technology Manual.	
2. Plans coordinated with Utilities identifying Point of Connection and routing from building to ROW.	

3. Schematic diagrams of the overall system(s) and to what space they are serving.	
4. Preliminary layout/floor plan drawings showing: <ul style="list-style-type: none"> a. Condition/Heated zones and areas b. Major equipment rooms layouts, accounting for O&M clearances. c. Special or unique system locations d. Preliminary routing of ducts larger than 12", drainage larger than 4" and water lines larger than 2" e. Air intake and exhaust locations. Check locations and proximity of intake/exhaust to each other as required by codes. f. Pressurized spaces identified for tunnels 	
5. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	
6. Drawing order is outlined in the Design Technology Manual	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities:

ACTION	Y/N
1. Support development of preliminary Equipment Matrix as part of PIIP	

EP-03 CHECKLIST: MECHANICAL (HVAC and Plumbing)– FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Report updated to a FINAL state.	
2. Technical memoranda have been reviewed by ST and approved. List final titles and revisions below.	
3. Known Letters of Concurrence have drafted or completed. List below and state status.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC), if any:

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C. Calculations:

ACTION	Y/N
1. Submitted Heat and Cooling load calculations	
2. Submitted Equipment fan, pump, duct sizing, etc. calculations	
3. Heat trace and insulation calculations	
4. Elevator hoist way ventilation, humidity and preliminary calculations	
5. Inputs into the Energy usage / budget calculations	
6. Domestic water calculations for sizing of lines and fixture selection	
7. Drainage and sewer calculations for sizing of lines and fixture selection	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified in the BOD and flagged for Constructability Reviews as identified by the project in compliance with EP-08. Provide design information to support Constructability Reviews.	

2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
3. Responded to and addressed all issues identified in previous Constructability Reviews.	
4. Develop design and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual.	
5. Equipment designed included in Clash Detection models.	
6. Participate in and resolve issues identified in Gap Analysis of BIM models.	
7. Confirm specified equipment complies with Buy America.	
8. Support development of Equipment Circulation Diagrams.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified at 30% level resolved.	
2. Interdisciplinary coordination ongoing to inform submittal included: <ul style="list-style-type: none"> • Coordination with Architectural for envelope, energy code compliance, identification of heated/conditioned spaces, space planning, penetrations, fixture location, water demand and drainage approach, equipment chases, intake/discharge locations and equipment access. • Coordination with structural including structural loads of equipment if required, equipment concrete pad locations, pipe penetrations, duct penetrations, seismic/thermal expansion joints etc. All conflicts identified and resolved. • Coordination with communication system and electrical including Internal Heat Loads defined and mechanical equipment electrical requirements. Coordinated Heat trace controller size and location. • Coordination with Civil/Utilities (ex. POC connection size, demand and elevation) • Coordination with Controls design (ex. Define inputs/outputs to central control systems and/or Building Management System) 	
3. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ol style="list-style-type: none"> a. Interface Block Diagrams at a pre-final status with Concept of Operations outlined. b. Support development of Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Design schematics and Sequence of Operations developed to supersede Interface Block Diagrams in construction documents. d. Identify ICDs (Interface Control Documents) in list below. Respond to ICDs requiring input from other designers. 	
4. Participate in Gap Analysis using BIM model	
5. Interface defined and coordinated: <ol style="list-style-type: none"> a. Identify all utility connections, connection locations and preliminary sizing. b. Preliminary mechanical equipment space proofing c. Identify intake and exhaust locations 	

d. Preliminary electrical coordination of equipment power requirements including any special requirements.	
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List ICDs:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Commissioning specifications included with identified adjustments specific to the design prior to modification request	
3. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, per the Design Technology Manual are complete. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
2. All facility plans and sections identified in the Design Technology Manual progressed to a 60% level. Drawing to show sizing, clearances, routing, floor plans, equipment locations, risers, schematics, equipment schedules, sequence of operations and installation details.	
3. Equipment schedules to include basis of design product, size, notes, and electrical requirements.	
4. Sequence of Operation and system interface drawings identifying normal operation and emergency operation. Interfaces with control systems to be coordinated and shown.	
5. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	
6. List incorporation of ST Standard Drawings below. <ul style="list-style-type: none"> a. STD-MPS130 - Domestic Water Schematic and Details b. STD-MPS131 - Plumbing System Control Strategy Schematics c. STD-MHS 140 – HVAC BMS Control Strategy Schematics 	
7. For Mechanical - Plumbing <ul style="list-style-type: none"> a. Special systems shown in plan view, including header diagrams. b. Pipe chase locations shown, with major chases modeled. c. Water one line diagram d. Piping plans e. Updated riser diagrams 	

<ul style="list-style-type: none"> f. Show all fixtures, controls, valves, etc. on applicable drawings. g. Supply mains and cross mains shown. h. Drainage locations shown, including floor drains. i. Hazards classified and major joints identified on plans. j. All gravity lines shown. 	
<p>8. For Mechanical - HVAC</p> <ul style="list-style-type: none"> a. Space proofing (equipment into and removal from structure) substantially complete, with conflicts identified. b. Equipment sized for O&M requirements, with dimensions shown. c. Equipment list shown. d. Control diagram and panel locations shown. e. One line duct layout f. Control unit locations identified. g. Show required hydronic piping, control, valves, pumps, etc. h. All controlled and monitored dampers, including all motorized fire/smoke dampers identified and located. i. Updated one line flow diagrams. j. Coordinated electrical loads with electrical design, identified panel and disconnect requirements. 	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: MECHANICAL (HVAC and Plumbing) – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. No updates to Basis of Design Finalized at 60%	
2. Technical memoranda have been reviewed by ST and approved. List final titles and revisions below.	
3. Known Letters of Concurrence have drafted or completed. List below and state status.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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List Letters of Concurrence (LOC), if any:

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C. Calculations:

ACTION	Y/N
1. Submitted Heating and cooling load calculations	
2. Submitted Equipment fan, pump, duct sizing, piping and etc. calculations	
3. Heat trace and insulation calculations	
4. Elevator hoist way ventilation, humidity and preliminary calculations	
5. Inputs into the Water and Energy usage / budget calculations	
6. Domestic water calculations for sizing of lines and fixture selection	
7. Drainage and sewer calculations for sizing of lines and fixture selection	

D. Constructability

ACTION	Y/N
1. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
2. Responded to and addressed all issues identified in previous Constructability Reviews. Support Constructability Review as the project defines in compliance with EP-08.	

3. Design and drawings in compliance with BIM and 3D modeling requirements of the Design Technology Manual.	
4. Participate in and resolve issues identified in Gap Analysis of BIM models.	
5. Confirm specified equipment complies with Buy America.	
6. Support finalization of Equipment Circulation Diagrams.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues resolved and complete.	
2. Interdisciplinary coordination complete: <ul style="list-style-type: none"> • Coordination with Architectural for envelope, energy code compliance, identification of heated/conditioned spaces, space planning, penetrations, fixture location, drainage approach, equipment chases, intake/discharge locations and equipment access. • Coordination with structural including structural loads of equipment if required, equipment concrete pad locations, pipe penetrations, duct penetrations, seismic/thermal expansion joints etc. All conflicts identified and resolved. • Coordination with system electronic and electrical including Internal Heat Loads defined and mechanical equipment electrical requirements. Coordinated Heat trace controller size and location. • Coordination with Civil/Utilities (ex. POC connection size, demand and elevation) • Coordination with Controls design (ex. Define inputs/outputs to central control systems and/or Building Management System) 	
3. Actively participated in design team, Project Integration Implementation Plan and support plan identified deliverables: <ol style="list-style-type: none"> a. Finalize Interface Block Diagrams with Concept of Operations outlined. b. Finalized Equipment Circulation Diagrams, including identification of equipment requiring remote monitoring. c. Finalized design schematics and Sequence of Operations in construction documents. d. Finalized ICDs (Interface Control Documents). Open ICD's to be listed below. e. Participated in Gap Analysis using BIM model. 	

List ICDs:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated.	
2. Specifications complete and coordinated with the drawings.	

3. Incorporate all approved ST Standard Specification modification requests. Complete all Standard Specification modifications, including tailoring commissioning specifications to the design and project.	
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List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, per the Design Technology Manual are complete. General notes identify applicable design codes and criteria, fabrication requirements and limitations, testing and inspection requirements, etc.	
2. All facility plans and sections identified in the Design Technology Manual progressed to a 60% level. Drawing to show sizing, clearances, routing, floor plans, equipment locations, risers, schematics, equipment schedules, sequence of operations and installation details.	
3. Equipment schedules to include basis of design product, size, notes, and electrical requirements.	
4. Sequence of Operation and system interface drawings identifying normal operation and emergency operation. Interfaces with control systems to be coordinated and shown.	
5. Equipment naming and identification complies with ST Equipment and Facilities Numbering Standard.	
6. List incorporation of ST Standard Drawings below. a. STD-MPS130 - Domestic Water Schematic and Details b. STD-MPS131 - Plumbing System Control Strategy Schematics c. STD-MHS 140 – HVAC BMS Control Strategy Schematics	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Included equipment in Equipment Matrix as part of integration efforts.	
2. Specifications include identification of spare parts and equipment to be supplied.	

EP-03 CHECKLIST: RIGHT OF WAY – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Private and AHJ Properties (Design-Bid-Build Only):

ACTION	Y/N
1. Right-of-entry (ROE) request for discovery activities and advance design.	
2. Develop work plans for invasive ROE requests.	
3. Refine the partial acquisitions for ROW requirements, which include permanent and temporary construction easements for guideway, columns, tunnel, walls, roadways, TPSSs, signal houses, utilities, cut-and-fills, and accesses. In addition, property rights required for ST Facility, Operation and Security.	
4. Order and review title reports for partial acquisition and begin preparations for parcel maps and legal descriptions. Identify any additional full acquisitions (Order and review title reports and request for ALTA surveys).	
5. Prepare exhibits and begin negotiation for Letters of Concurrences (LOCs) with AHJ on roadway improvements around ST stations or roadway improvement because of Sound Transit’s project. LOC should be signed prior to Civil Certification.	
6. Prepare exhibits and begin negotiation for Transit Way Agreements with AHJ. Transit Way Agreements should be signed prior to Civil Certification.	
7. Final ROW base mapping completed including supplemental field survey.	
8. Signed parcel maps and legal descriptions, unsigned ALTA surveys shall be submitted to ROW Engineering prior to Civil Certification.	
9. Finalize exhibits and negotiate with utility companies for utility relocations and dispositions LOC. LOCs should be signed prior to Civil Certification.	
10. Civil Certify the full acquisitions which include completion of certification deliverable schedule, parcel by parcel reviews, Civil Certification letter, parcel list, ROW plans, Letter of Concurrences (if available), ROW Title Report Review Memos, Standard Restoration Checklist, and Property Commitment Matrix.	
11. In-progress ROW plans at 1”=20’ and ROW Monumentation plans at 1”=200’.	

C. Private and AHJ Properties* (Design-Build Only):

* May need to be done also during CE depending on delivery schedule.	
ACTION	Y/N
1. Right-of-entry (ROE) request for discovery activities and advance design.	
2. Right-of-entry (ROE) request for construction activities.	
3. Refine and finalize partial and full acquisitions for ROW requirements which include permanent and temporary construction easements for guideway, columns, tunnel, walls, roadways, TPSSs, signal houses, utilities, cut-and-fills, and accesses. Also, property rights required for ST Facility, Operation and Security.	
4. Order and review title reports for partial acquisition and prepare parcel maps and legal descriptions for partial acquisitions.	
5. Prepare exhibits and begin negotiation for Letters of Concurrences (LOCs) with AHJ on roadway improvements around ST stations or roadway improvement as a result of ST’s project. LOC should be signed prior to Civil Certification.	

6. Prepare exhibits and begin negotiation for Transit Way Agreements with AHJ. Transit Way Agreements should be signed prior to Civil Certification.	
7. Final ROW base mapping completed including supplemental field survey.	
8. Parcel maps and legal descriptions, ALTA surveys unsigned and submitted to ROW Engineering prior to Civil Certification.	
9. Civil Certify all remaining acquisitions, which include certification deliverable schedule, parcel by parcel reviews, Civil Certification letter, parcel list, ROW plans, Letters of Concurrences, ROW Title Report Review Memos, Standard Restoration Checklist, and Property Commitment Matrix.	
10. Finalize exhibits and negotiate with utility companies for utility relocations and dispositions LOC. LOCs should be signed prior to Civil Certification.	
11. Final ROW plans at 1"=20' and ROW Monumentation plans at 1"=200'.	
12. Design support for property acquisitions, condemnations, and trials.	
13. Develop P&U Matrix to meet property acquisition schedule (not all property rights will be in hand prior to DB NTP).	
14. Develop and finalize ROW closeout scope	

D. WSDOT Right-of-Way Acquisition Plan (RAP) and Temporary Construction Airspace Lease and (Long-term) Airspace Lease (Design-Bid-Build Only):

ACTION	Y/N
1. Temporary and Permanent Air Space Lease Documents: <ul style="list-style-type: none"> • In-progress Right-of-Way Acquisition Plan(s) • In-progress Air Space Leases & Exhibits • In-progress Temporary Construction Air Space Leases & Exhibits • In-progress Legal Descriptions • In-progress WSDOT ROW Drawings with Lease Areas and Access Breaks • In-progress Aerial Maps with Project Alignment 	
2. Supplemental WSDOT Limited Access Break Documents <ul style="list-style-type: none"> • In-progress Access Break Questionnaire and Break Request • In-progress Supplemental Breaks Table • In-progress Supplemental Breaks drawings • In-progress Preliminary Traffic Management Plan 	

E. WSDOT Right-of-Way Acquisition Plan (RAP) and Temporary Construction Airspace Lease and (Long-term) Airspace Lease (Design-Build Only):

ACTION	Y/N
1. Temporary and Permanent Air Space Lease Documents: <ul style="list-style-type: none"> • Develop and Finalize Right-of-Way Acquisition Plan(s) • Develop and Finalize Air Space Leases & Exhibits • Develop and Finalize Temporary Construction Air Space Leases & Exhibits • Develop and Finalize Legal Descriptions • Develop and Finalize WSDOT ROW Drawings with Lease Areas and Access Breaks • Develop and Finalize Aerial Maps with Project Alignment 	
2. Supplemental WSDOT Limited Access Break Documents <ul style="list-style-type: none"> • Develop and Finalize Access Break Questionnaire and Break Request • Develop and Finalize Supplemental Breaks Table 	

<ul style="list-style-type: none">• Develop and Finalize Supplemental Breaks drawings• Develop and Finalize Preliminary Traffic Management Plan	
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EP-03 CHECKLIST: RIGHT OF WAY – FINAL DESIGN (60%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. In-Progress 60% (Design-Bid-Build Only):

ACTION	Y/N
1. Right-of-entry (ROE) request for discovery activities and advance design.	
2. Develop work plans for invasive ROE requests.	
3. Finalize the partial acquisitions for ROW requirements, which include permanent and temporary construction easements for guideway, columns, tunnel, walls, roadways, TPSSs, signal houses, utilities, cut-and-fills, and accesses. In addition, property rights required for ST Facility, Operation and Security.	
4. Order and review remaining title reports for partial acquisition and request for parcel maps and legal descriptions.	
5. Identify final additional full acquisitions (Order and review title reports and request for ALTA surveys).	
6. Finalize exhibits and negotiations for LOCs with AHJ on roadway improvements around our stations or roadway improvement because of ST's project and have it signed prior to Civil Certification.	
7. Finalize exhibits and negotiations for Transit Way Agreements with AHJ. Transit Way Agreements should be signed prior to Civil Certification.	
8. Finalize exhibits and negotiate with utility companies for utility relocations and dispositions LOC. LOCs should be signed prior to Civil Certification.	
9. Signed parcel maps and legal descriptions, unsigned ALTA surveys shall be submitted to ROW Engineering prior to Civil Certification.	
10. Prepare final Civil Certifications of the partial and full acquisitions which include completion of certification deliverable schedule, parcel by parcel reviews, Civil Certification letter, parcel list, ROW plans, Letters of concurrences, ROW Title Report Review Memos, Standard Restoration Checklist, and Property Commitment Matrix.	
11. In-progress ROW plans at 1"=20' and ROW Monumentation plans at 1"=200'.	

C. Post 60% (Design-Bid-Build Only):

ACTION	Y/N
1. Right-of-entry (ROE) request for construction activities.	
2. Unanticipated acquisitions for ROW requirements.	
3. Review title reports for unanticipated partial acquisitions and full acquisitions.	
4. Finalize parcel maps and legal descriptions, ALTA surveys unsigned and submitted to ROW Engineering.	
5. Civil Certification for unanticipated rights which include certification deliverable schedule, parcel by parcel reviews, Civil Certification letter, parcel list, ROW plans, Letter of concurrences, ROW Title Report Review Memos, Standard Restoration Checklist, and Property Commitment Matrix.	
6. Final ROW plans at 1"=20' and ROW Monumentation plans at 1"=200'.	
7. Design support for property acquisitions, condemnations, and trials.	
8. Develop ROW closeout scope.	

EP-03 CHECKLIST: STATION STRUCTURAL – PRELIMINARY ENGINEERING (30%)

Contractor shall develop the checklist for underground stations based on Station and Tunnel checklist
Refer to **GUIDEWAY STRUCTURES EP-03 Checklist for Elevated Support Structures**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo has been drafted and includes all code references identifying applicable version and year. Includes requirements by appropriate AHJs. Identifies the Earthquake Resisting System. Includes seismic design criteria for intermediate mezzanine integral with elevated guideway and associated Peer Review Plan, as applicable. (Final accepted if Design-Build)	
2. Technical memoranda have been identified and started.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

<ol style="list-style-type: none"> 1. Structural input on environmental documentation and permits 2. Peer Review plan for review of: <ol style="list-style-type: none"> a. Seismic Force Resisting System if an intermediate mezzanine level is present and integral with the elevated guideway structure, including input ground motions b. Plastic mechanism design verifying sufficient displacement capacity to meet seismic demands.
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C. Calculations:

ACTION	Y/N
1. Provide Table of Contents	
2. Preliminary demand / capacity checks for identified critical structural issues including intermediate mezzanine integral with elevated guideway.	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified in	
2. Review for viable construction method and schedule.	
3. Impacts to public and traffic ROW identified	

E. Interdisciplinary Coordination:

ACTION	Y/N

1. Preliminary interdisciplinary coordination issues identified in design narrative	
2. Interdisciplinary coordination initiated and included: Coordination with other disciplines, particularly architectural and geotechnical. Coordinate for anticipated construction sequence and structural penetrations.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline Project Specifications Index	
2. Project Specifications Developed (for Design-Build)	
3. Division 00 & 01 Specifications provided (for Design-Build)	
4. Draft Construction Submittal list (for Design-Build)	

G. Quantities

ACTION	Y/N
1. Not applicable	

H. Drawings:

ACTION	Y/N
1. Preliminary Drawing List	
2. Preliminary Key Plans and General Arrangement plans shown with labels and sectors identified.	
3. Preliminary Symbols, Abbreviations, and Legend Sheets	
General Notes shall identify: <ul style="list-style-type: none"> a. Applicable design codes, criteria, and project requirements. b. Geotechnical parameters and seismic criteria, c. Specified material properties for strength, stiffness, and density. <p style="margin-left: 40px;"><u>Note:</u> List all material densities to be used for concrete.</p>	
4. General Notes: Design Criteria: Provide Complete structural design criteria as required by IBC codes for dead, live, wind, snow, seismic and other applicable load conditions. Additionally, provide all the following code based seismic information: <ul style="list-style-type: none"> a. Risk Category, Importance Factors Ie b. Seismic Site Parameters Ss, S1, Fa, Fv, Sds, Sd1, Site Class, Seismic Design Category c. Analysis procedure to be used. d. At elevated stations on guideway structures where both AASHTO and IBC codes apply document analysis procedure used and how this complies with both codes in accordance with Design Requirements Set 720. 	
5. Show demolition limits	
6. Areas requiring excavation support provided with no details, likely support methods identified	

7. Plans showing extent and structural requirements for any planned geotechnical ground improvements.	
8. Foundation Plans: a. Gridlines provided to define primary building structural geometry of walls and columns. b. Foundation elements shown with expected dimensions and building walls and columns above. c. Preliminary foundation elevations. d. Slab at grade geometry e. Identify any adjacent or crossing utility services or easements. f. Extent of all retaining walls.	
9. Floor and roof plans, elevations, and sections. a. Gridlines provided to define primary structural geometry of walls and columns. b. Show general structural geometry, sizes, and types of major structural elements. c. Materials identified. d. Floor and roof elevations with sloping shown. e. Extent of all structural walls.	
10. Framing Plans: Extent (edges), span and all floor, roofs, diaphragms and canopies shown and identified.	
11. Seismic separations (joints) shall be shown on all plans, elevations and sections to define full 3-dimensional configuration of movement joints and how they shift between floors of all levels.	
12. All Seismic lateral force systems identified on plans, with full height building sections defining the vertical geometry of each lateral frame/wall system.	
13. Structural Walls located in plans, sections and elevations.	
14. Preliminary plans, sections, elevations of intermediate mezzanine including transition to elevated guideway.	
15. Show and identify all elevators escalators and stair ID's and locations. s.	
16. Drawings shall comply with ST and industry standards for proper clean and clear presentation of all structural elements and their extents.	
17. Preliminary configuration of all heavy non-structural Masonry and Concrete partition/cladding walls shown and identified	
18. Plans shall show any adjacent property lines for reference with minimum required property line set-backs for lateral displacement required by code.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

EP-03 CHECKLIST: STATION STRUCTURAL – FINAL DESIGN (60%)

Contractor shall develop the checklist for underground stations based on Station and Tunnel checklist
Refer to **GUIDEWAY STRUCTURES EP-03 Checklist for Elevated Support Structures**

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo has been updated based on design developments.	
2. Technical memoranda have been updated.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

1. Preliminary Peer review report and progress for: a. Seismic Force Resisting System if an intermediate mezzanine level is present and integral with the elevated guideway structure, including input ground motions b. Plastic mechanism design verifying sufficient displacement capacity to meet seismic demands.

C. Calculations:

ACTION	Y/N
1. Provide Table of Contents with PDF bookmarks	
2. Development for all prior 30% requirements and implementation of 30% design review comment resolutions.	
3. Demand / Capacity checks for critical structural issues updated.	
4. The vertical and lateral structural systems have been developed and major structural components, including foundations, show preliminary sizes.	
5. Non-structural items: ASCE 7 Structural design requirements (force and deformation parameters) for non-structural items shall be identified. a. Non-Structural items to be designed in the structural drawings shall have preliminary design calculations developed. b. Non-Structural Items identified for deferred or delegated design, shall have displacement and acceleration parameters defined and connection points noted. Preliminary connection engineering shall be included, to confirm base structural design is sufficient for non-structural anchorage and connection forces.	

c. Excavation supports, if applicable, have been sized.	
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D. Constructability

ACTION	Y/N
1. Potential constructability issues resolved.	
2. Confirm viable construction method and schedule.	
3. Impacts to public and traffic ROW resolved.	
4. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues identified in design narrative	
2. Interdisciplinary coordination initiated and included: Coordination with other disciplines, particularly architectural and geotechnical. Coordinate for anticipated construction sequence and structural penetrations.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Draft Specifications for all project elements of work have been developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	
3. Draft Construction Submittal list	
4. Letter of Concurrence on Consultant signed/stamped Divisions 01 Specifications (for Design-Build)	

List any modification requests for ST Standard Specifications:

G. Quantities

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

H. Drawings:

ACTION	Y/N

1. Development of all prior 30% requirements and implementation of 30% design review comment resolutions.	
2. Updated Drawing List	
3. Key plans and general arrangement plans shown with labels and sectors identified	
4. Updated Symbols, Abbreviations, and Legend Sheets	
5. Updated General Notes with all the requirements from 30% updated for 60% design, including <ul style="list-style-type: none"> a. Seismic structural parameters and basic Seismic Force Resisting System (SFRS), R, Cd, Ω_0, Cs and design base shears for each structure or portion thereof. b. Seismic design penalties – redundancy factors, torsional amplification factors, Vertical and Horizontal Irregularity list with associated penalties. c. List all anticipated special inspections and testing. d. List structural observations to be performed by the Engineer of record e. List all delegated and/or deferred structural designs that will not be included on the final 100% structural design and permit packages. 	
6. Loading Plans with superimposed dead loads and live loads on floor/roof keyed plans with impact loads and areas. <ul style="list-style-type: none"> a. Dimensioned locations of heavy non-structural Masonry or Concrete partition/cladding walls for loading 	
7. LRV loading plans. Identify LRV derailment zones and barrier walls or impact load criteria for infringing structural elements not otherwise protected by crash barriers.	
8. Demolition Plans	
9. Special work areas identified.	
10. Areas requiring excavation support developed with details showing support concepts.	
11. Plans showing developed extent and structural requirements for any planned geotechnical ground improvements.	
12. Foundation plans developed further from the 30% requirements with the following additional requirements. <ul style="list-style-type: none"> a. Foundation plans with gridlines, typical dimensions and foundation sizes and depths noted. b. Plans have section and detail callouts. c. All structural slabs at grade that are required to act as diaphragms for lateral resistance or stability are clearly identified. d. Update any adjacent or crossing utility services or easements. e. All major pits/depressions and trenches are shown on plans with corresponding details. f. All retaining wall thickness and extent shown and dimensioned. g. Edges of slabs at grade are shown and identified. 	
13. Floor and Roof Framing plans developed further from the 30% requirements and are generally complete showing full structural design for all structural floors/roofs/catwalks or other diaphragms: <ul style="list-style-type: none"> a. Building gridlines are fully dimensioned and coordinated with design team. b. Floor and roof elevations are fully noted. 	

<ul style="list-style-type: none"> c. Typical dimensions are provided from gridlines. d. Structural element materials are identified. e. Final member sizes and construction requirements are shown (rebar scheduled; connection types identified; composite studs noted). f. All floor/roof steps, slopes, depressions, trenches and major openings (openings larger than 2ft) are shown and properly framed. g. All Wall thickness and extent noted with openings at floor shown and dimensioned. h. Edges of all slabs/floors/roofs/diaphragms are shown and identified. i. Dimensioned locations of heavy non-structural Masonry or concrete partition/cladding walls shown with added vertical supporting and lateral bracing primary structural elements required. 	
<p>14. Seismic Movement Separations (joints) are developed from 30% design with any updates for 60% to locations, geometry, size and movement demands provided on plans, elevations and sections. Preliminary maximum displacements of structures in all directions shall be provided. Displacement demands for elements crossing these separations shall be identified for all directions (expansion, contraction, shearing and vertical). Vertical displacements and differential settlements across joints shall be identified for critical load cases including but not limited to both long term soil settlement and seismic settlement/deflections.</p>	
<p>15. Floor and roof plans, elevations, and sections developed further from 30% design and include:</p> <ul style="list-style-type: none"> a. Floor/roof elevations noted. b. Materials of all elements clearly defined. c. Structural elements and elevations which are not noted on building plans. d. Fully define all braced frames with element sizes and work points shown. e. Reference and label of all structural member types. f. Provide elevation(dimensions) to top of all structural parapet walls. g. All wall openings larger than 2ft shown with elevations (dimensions) to top and bottom of opening. Dimension edges of openings not provided on framing plans. 	
<p>16. Column and beam schedules templates are provided and referenced. Final primary member sizes and reinforcing are identified.</p>	
<p>17. Typical Details sheets for all primary structural elements including:</p> <ul style="list-style-type: none"> a. Concrete/rebar typical details b. Foundation/slab at grade typical details c. Column typical details. (for all materials used) d. Wall typical details (for all materials used) e. Floor framing typical details (Reinforced concrete, prestressed concrete, steel framing, connections, metal deck with/without fill) f. Wall and floor opening typical details g. Preliminary details for non-structural attachments such as cladding/curtain walls systems, roof tie off system. 	
<p>18. Steel column base plate and collector embed plate detail requirements.</p> <ul style="list-style-type: none"> a. All column base plates shall be detailed and coordinated with concrete reinforcement below. 	

<ul style="list-style-type: none"> b. Collector embed plates shall be coordinated with concrete wall and boundary zone reinforcement. c. Identify any services that may be required to pass through column baseplates and coordinate details. d. Steel column base plates placed above concrete columns at floors or on elevated pedestals or wall boundary elements shall have double line concrete details (plan and sections) developed to confirm sufficient sizing of concrete elements for connection, design coordination and constructability. e. Seismic Collector beam embed plates shall have double line concrete details (plans and sections) developed to confirm sufficient sizing of concrete elements for connection, design coordination and constructability. f. Double line details shall diagrammatically show wall rebar. g. Connection details show allowance for concrete construction tolerances. 	
<p>19. Structural framing details are provided:</p> <ul style="list-style-type: none"> a. Preliminary critical connection details for all seismic connections of collectors and seismic force resisting elements developed. (including welding and bolting for steel connections.) b. Preliminary development of general non seismic steel details. (welding / bolting not fully required at 60%.) c. Concrete components sized, reinforcing and confinement of primary structural members shown and identified. 	
<p>20. Framing Plans and building sections for all primary stairs and stairs that are not deferred design build items.</p> <ul style="list-style-type: none"> a. Identify all stair framing elements and geometry. b. Full structural plans and sections of primary stair systems noting locations of seismic joints at stairs to allow free movement of connecting floors. If no joints are shown, calculations will need to show seismic design includes the stiffness of the stairs in the analysis and confirms the stairs remain elastic with no damage though the code required maximum inelastic seismic displacements. c. Provide preliminary connection details. Details shall show how and where seismic movements are accommodated. 	
<p>21. Developed plans, sections, elevations, and details of intermediate mezzanine including transition to elevated guideway.</p>	
<p>22. Critical special details such as expansion joint covers and seismic isolators/joints shown.</p>	
<p>23. Developed configuration of all heavy non-structural Masonry and Concrete partition/cladding walls shown and identified for structural loading, bracing and seismic separation requirements.</p>	
<p>24. Preliminary Artwork support identified.</p>	
<p>25. As applicable, temporary structures identified.</p>	
<p>26. Stray current mitigation elements shown.</p>	
<p>27. Stairs, escalators and elevators are identified on structural plans/sections with project specific identifiers coordinated with other discipline drawings.</p>	
<p>28. Vertical transportation details shown and dimensioned.</p>	
<p>29. Maintenance and safety elements and attachments shown.</p>	
<p>30. Drawings are coordinated with the specifications:</p>	

a. Terminology is consistent between the two documents	
b. Specified materials and products are consistent between the two documents	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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EP-03 CHECKLIST: STATION STRUCTURAL – FINAL DESIGN (90% and 100%)

Contractor shall develop the checklist for underground stations based on Station and Tunnel checklist
Refer to **GUIDEWAY STRUCTURES EP-03 Checklist for Elevated Support Structures**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo final.	
2. Technical memoranda have been submitted.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

1. Final Peer review report complete and submitted.

C. Calculations:

ACTION	Y/N
1. Final Table of Contents with PDF bookmarks	
2. Progression of for all prior stage calculation requirements and implementation of prior design review comment resolutions from 30% and 60% submissions.	
3. Calculations complete and submitted with outstanding minor refinement and coordination that does not impact scope and schedule.	
4. Calculations include: Gravity, Seismic, and Wind and all other code required design evaluations and design for all primary structural items not identified for deferred design.	
5. Calculations include: Seismic evaluation and design for non-structural items not identified for deferred design, but that require structural design per ASCE 7.	
6. Calculations include excavation support design, if applicable	
7. Structural Connection calculations are complete for all materials.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	
2. Viable construction method and schedule finalized	
3. Impacts to public and traffic ROW resolved	
4. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete and includes structural penetrations by other disciplines with outstanding minor refinement and coordination that does not impact scope and schedule.	
2. Interdisciplinary review included: Structural review of non-structural specifications, with attention given to references to structural seismic criteria and movements, concrete, steel and other structural metals, fasteners, and concrete anchors, etc.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings with outstanding minor refinement and coordination that does not impact scope and schedule.	
4. Construction Submittal list identifying submittals ST is responsible to review.	

List any modification requests for ST Standard Specifications:

G. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

H. Drawings:

ACTION	Y/N
1. Finalization of all prior stage report requirements and implementation of prior design review comment resolutions from 30% and 60% submissions.	
2. Final complete Drawing List provided with outstanding minor refinement but describes estimate of detail sheets	
3. Final complete key plans and general arrangement plans are provided with labels and sectors identified.	
4. Final coordinated and complete Symbol, Abbreviation and Legend sheets.	

<p>5. Final coordinated and complete General Notes incorporating all the requirements from prior submittals</p>	
<p>6. Final coordinated and complete loading plans, incorporating all the requirements of prior submittals with the following additional information:</p> <ul style="list-style-type: none"> a. Note equipment locations, size, weight and required concrete pad geometry for all major MEP equipment over 400lbs to confirm structural design coordination. b. Locate, and identify all cladding/curtain wall connection points to structure with allowable reactions included in the design. c. Note fall arrest and roof tie of point reaction points on roofs and allowable reactions included on the structural design. 	
<p>7. LRV loading plans. Finalize LRV derailment zones and barrier walls or impact load criteria for infringing structural elements not otherwise protected by crash barriers.</p>	
<p>8. Demolition plans and details finalized.</p>	
<p>9. Special work areas finalized.</p>	
<p>10. Areas requiring excavation support finalized with details showing support concepts.</p>	
<p>11. Plans showing final extent and structural requirements for any planned geotechnical ground improvements.</p>	
<p>12. Final coordinated and complete foundation plans incorporating all the requirements from prior submittals with the following additional requirements:</p> <ul style="list-style-type: none"> a. All pipe penetrations through foundations are noted and dimensioned with elevations on the structural plans with detail references and pipe sleeve requirements. b. All structural foundations, floors, pits, trenches are fully dimensioned from building grid lines, with elevations, annotated and referenced. c. All vertical structure supported by foundations fully dimensioned from building grid lines, annotated and referenced. 	
<p>13. Final coordinated and complete floor and roof framing plans incorporating all the requirements from prior submittals with the following additional requirements.</p> <ul style="list-style-type: none"> a. All structural framing shall be fully identified, dimensioned relative to gridlines with elevations. b. All connection details shall be referenced either through typical symbols on legend sheet or through direct detail callouts on the framing plans. c. Floor and roof geometry (pits, depressions, ridges, valleys, trenches) must be fully defined and dimensioned to supported framing and gridlines. d. All floor/roof edges must be fully dimensioned on the structural framing plans. Edge of floor/roof details must be identified for all conditions and coordinated with the architectural drawings. e. All required MEP openings and structure embedments shall be shown and dimensioned on the structural plans and coordinated with MEP and Architectural drawings. f. All walls, columns and post and hangers shall be clearly sized, identified and dimensioned on structural framing plans with clear referencing to all schedules and details. 	

<p>g. Final seismic separations are fully detailed, sized and coordinated. Full movement requirements across seismic separations for all horizontal and vertical relative displacements are noted.</p> <p>h. Floors and roof clearly note total maximum seismic deflections from building base and also maximum seismic drift ratios from floor below.</p>	
<p>14. Seismic Movement Separations (joints) are complete and incorporate all the requirements of prior submittals including locations, geometry, size and movement demands provided on plans, elevations, and sections.</p>	
<p>15. Final Coordinated Full building structural elevation and section sheets incorporating all the requirements of prior submittals along with the following additional requirements:</p> <p>a. All wall openings coordinated and shown on wall elevations.</p> <p>b. Braced frame elevations shall be complete with all work points shown and dimensioned consistent with the final connection details.</p> <p>c. Elevations and section sheets shall be fully dimensioned relative to gridlines, with elevations noted, fully annotated, and fully referenced.</p> <p>d. Seismic separations are fully identified on sections with any additional relative displacement requirements not provided on the framing plan sheets.</p>	
<p>16. Column and beam schedules incorporating all the requirements from prior submittals are complete coordinated and fully referenced.</p>	
<p>17. Detail drawings comply with requirements noted in prior submittals are complete, dimensioned, fully annotated, and referenced. Concrete details shall be to-scale, double line reinforcement details in areas of high reinforcement congestion such as beam-to-column connections, boundary elements, etc. in addition to column base plate and collector beam embed detailing requirements from 60%.</p>	
<p>18. Steel column base plate and collector embed plate details are complete and incorporate all the requirements from previous submittals.</p>	
<p>19. Structural framing details are complete: Steel members sized, connection and welding details defined and finalized Concrete components sized, reinforcement shown and identified</p>	
<p>20. Floor/wall penetrations located and detailed.</p>	
<p>21. Details at expansion joints, seismic isolators/joints and related detailing complete</p>	
<p>22. Walls fully designed, detailed, and dimensioned.</p>	
<p>23. Artwork support finalized and detailed with outstanding refinement and coordination that does not impact scope and schedule.</p>	
<p>24. As applicable, temporary structures designed and detailed</p>	
<p>25. Stray current mitigation elements finalized</p>	
<p>26. Stairs, escalators and elevators are identified on structural plans/sections with project specific identifiers coordinated with other discipline drawings.</p>	
<p>27. Vertical transportation details indicate VT, escalator, and elevator support reactions (buffers, rails, sheave beams, etc.) magnitude and locations with deflection limits used for the basis of design on the structural drawings.</p>	
<p>28. Identify and note size of all stair and escalator seismic movement joints at each level per ASCE 7.</p>	
<p>29. Maintenance and safety elements and attachments complete.</p>	
<p>30. Drawings are coordinated with the specifications:</p>	

a. Terminology is consistent between the two documents	
b. Specified materials and products are consistent between the two documents	

Note: Drawings may require minor refinement that does not impact scope and schedule.

Provide notes on the implementation of ST Standard or Guidance Drawings:

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EP-03 CHECKLIST: TRACK - PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Memo has been drafted. (Final accepted if Design-Build) Should include at a minimum the following information: High rail access point verification compliance, Pocket track spacing, Length of Tail track design verification, Verification of track types, Yard layout and circulation and site access, Track stationing documentation to ensure accuracy and correctness of pre-existing stationing.	
2. Technical memoranda, if needed, have been drafted.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Critical horizontal and vertical clearances identified.	
2. Horizontal and vertical geometry data calculations developed for design speeds, including overspeed calculations.	
3. Track spacing calculations	
4. Track clearance calculations	
5. Clearance line calculations	
6. Superelevation calculations	
7. Bumping post calculations	
8. Rail expansion joint calculations	

D. Specifications:

ACTION	Y/N
1. Outline specifications required for the project.	

E. Drawings:

ACTION	Y/N
GENERAL	
1. Design review comments addressed in submittal documents.	
2. Conforms to applicable codes, standards and design guidelines.	
3. Reviewed in accordance with QC Plan.	

4. Staff briefed on QC requirements.	
5. Cost estimates completed.	
6. Drawings conform to Design Technology standards.	
7. Title, sheet name and sheet number on each sheet.	
8. North arrow on each sheet at correct orientation.	
9. Scale(s) called out and scale bar(s) on each sheet.	
10. Project number on each sheet.	
11. Positive versus negative numbers confirmed.	
12. Spelling, punctuation and grammar correct.	
13. Verify all drawings references are correct	

TRACK CHARTS

1. Illustrate and label all rail types and limits	
2. Contract limits shown	
3. Illustrate Horizontal alignment per Design Technology Manual	
4. Illustrate Vertical Alignment (control track only)	
5. Illustrate and label Hi-rail access, grade crossings and Emergency egress crossing, rail lubricators, Link rail stations.	
6. Define limits of each track structure type (Ballasted, Direct Fixation, Embedded track, etc)	
7. Provide drawing reference for each track type	
8. For each track curve provide track curve table with the following information. Track Curve number, PI stationing, Radius, Length of curve, Length of each spiral, Actual and unbalance superelevation and track design max speed.	
9. Label Milepost 1/10 th MP's in profile for control track	

ALIGNMENT DATA TABLES

1. Point of Beginning and Point of Ending defined	
2. Label all Station equations	
3. Label each Curve number	
4. Label each Curve alignment point designation type defined by type, station, Northing and easting coordinates. Including the PI point information	
5. Label the curve data including circular and spiral curve elements. (such as Delta angle, Delta Curve angle, Tangent curve Length, Tangent spiral length and Theta Spiral angle)	

SPECIAL TRACKWORK DATA TABLES

1. Label each Turnout size and type (LH/RH/EQ) and track designation	
2. Label Point of switch (PS) and PITO for each Turnout, including Stationing, Northing and Easting	

PLAN AND PROFILES

GENERAL DATA

1. Locations of existing features conform to documentation provided.	
2. Property, Transit way and Right of way lines shown	
3. City limits shown	

4. Linework and symbols conform to legend.	
5. Abbreviations per legend.	
6. Ensure no utility conflicts.	
7. References to sections, other drawings or notes correct.	
8. All proposed features located.	
9. Tracks properly labeled.	
10. Label typical section and track type limits (include track stationing)	

PLAN

1. Track centers conform to criteria.	
2. Label track centerlines with track number, stationing, station equations and curve numbers.	
3. Label roadway centerlines and road names/numbers.	
4. Label alignment point designations such as PC, PT, TS, SC, CS and ST.	
5. Track clearances conform to criteria.	
6. Show limits of High rail access locations	
7. Show limits of grade crossing panels	
8. Label begin and end of platform limits.	
9. Show OCS foundations	
10. Show bridge foundation outline	
11. For each track curve provide track curve table with the following information. Track Curve number, PI stationing, Radius, Length of curve, Length of each spiral, Actual and unbalance superelevation and track design max speed.	

PROFILES

1. Profile grades are shown and are correct.	
2. Proposed track profile shown and labeled	
3. Show and label profile grid including elevations and stationing	
4. Label PVC, PVI, PVT, length of vertical curve points, including Beginning point (PVC), end point (PVT), length of curve, vertical curve PI and Low point.	
5. Label vertical tangent grades	
6. Label platform limits (Begin and End) Show existing and name. proposed elevations.	
7. Label all station equations Vertical clearances conform to criteria.	
8. Show 100 year or 500 year flood elevation	

TYPICAL SECTIONS

1. Track structure conforms to design standards.	
2. Typical sections conform to requirements design criteria and standard plans.	
3. Stationing conforms to plans.	
4. Typical sections available provided for all portions representative sample of track different cross sections including cases where there are issues that need special consideration.	
5. Dimensions correct for typical section widths, thicknesses, slopes, ties, underdrains, geotextile fabric, barriers, fences, retaining walls, track centers and systems items.	

6. Show typical existing ground condition	
7. Emergency egress and walkway are shown along with Emergency egress clearance envelope.	

CROSS SECTIONS

N/A for 30%	
1.	
OTHER	

Provide notes on the implementation of ST Standard or Guidance Drawings:

F. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: TRACK – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo updated.	
2. Technical memoranda drafted.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations completed, verified and submitted	
2. Track Clearance envelope calculations	
3. Track Clearance envelope line defined and included in track plan	
4. Track spacing calculation	
5. Vertical overhead and under Clearance calculations	
6. Track Horizontal curve calculation	
7. Track Vertical curve calculation	
8. Overspeed calculation	
9. Bumping post calculation	
10. Track substructure ballast calculation	
11. High strength rail calculations (ductility, stiffness in relation to the structure)	

D. Constructability

ACTION	Y/N
1. Potential constructability issues identified.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination items in progress with all disciplines:	
a. Signals/Systems	
b. Overhead Catenary System (OCS)	
c. Traction Power	
d. Stray Current / Negative return	
e. Civil (Earthwork/Sitework)	
f. Roadway	
g. Utilities	
h. Drainage	
i. Mechanical (standpipe/fans)	
j. Structures – Tunnels, culverts, station, bridges, including rail/structure interaction analysis	
k. Structures – Retaining Walls, Ballast Retaining Walls, Barriers	
l. Architecture @ stations	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
GENERAL	
1. Design review comments addressed in submittal documents.	
2. Conforms to applicable codes, standards and design guidelines.	
3. Reviewed in accordance with QC Plan.	
4. Staff briefed on QC requirements.	
5. Cost estimates completed.	
6. Drawings conform to Design Technology Manual.	
7. Title, sheet name and sheet number on each sheet.	
8. North arrow on each sheet at correct orientation.	
9. Scale(s) called out and scale bar(s) on each sheet.	
10. Project number on each sheet.	
11. Positive versus negative numbers confirmed.	
12. Spelling, punctuation and grammar correct.	
13. Verify all drawings references are correct	

TRACK CHARTS

1. Illustrate and label all rail types and limits	
2. Contract limits shown	
3. Illustrate and label all IJ locations	
4. Illustrate Horizontal alignment per Design Technology Manual	
5. Illustrate Vertical Alignment (control track only) per Design Technology Manual	
6. Illustrate and label Hi-rail access, grade crossings and Emergency egress crossing, rail lubricators, Link rail stations.	
7. Define limits of each track structure type (Ballasted, Direct Fixation, Embedded track, etc)	
8. Provide drawing reference for each track type	
9. For each track curve provide track curve table with the following information. Track Curve number, PI stationing, Radius, Length of curve, Length of each spiral, Actual and unbalance superelevation and track design max speed.	
10. Label Milepost 1/10 th MP's in profile for control track	

ALIGNMENT DATA TABLES

1. Point of Beginning and Point of Ending defined	
2. Label all Station equations	
3. Label each Curve number	
4. Label each Curve alignment point designation type defined by type, station, Northing and easting coordinates. Including the PI point information	
5. Label the curve data including circular and spiral curve elements. (such as Delta angle, Delta Curve angle, Tangent curve Length, Tangent spiral length and Theta Spiral angle)	

SPECIAL TRACKWORK DATA TABLES

1. Label each Turnout size and type (LH/RH/EQ) and track designation.	
2. Label Point of switch (PS) and PITO for each Turnout, including Stationing, Northing and Easting	

PLAN AND PROFILES

GENERAL DATA

1. Locations of existing features conform to documentation provided.	
2. Property, Transit way and Right of way lines shown	
3. City limits shown	
4. Linework and symbols conform to legend.	
5. Abbreviations per legend.	
6. No utility conflicts.	
7. References to sections, other drawings or notes correct.	
8. All proposed features located.	
9. Tracks properly labeled.	
10. Label typical section and track type limits (include track stationing)	

PLAN

1. Track centers conform to criteria.	
2. Label track centerlines with track number, stationing, station equations and curve numbers.	
3. Critical horizontal clearances called out including at curves, retaining walls, structures, station platforms and untypical situations.	
4. Label roadway centerlines and road names/numbers.	
5. Label alignment point designations such as PC, PT, TS, SC, CS and ST	
6. Match lines compatible.	
7. Label limits of ballast mat	
8. Label begin and end of platform limits.	
9. Guideway structures are shown including Bridges, tunnels, culverts, abutments, approach slabs, track transition slabs and walls.	
10. OCS pole locations shown	
11. Work to be done by other disciplines called out.	
12. Removals shown and salvaged materials covered by notes or specifications.	
13. Show limits of High rail access locations	
14. Show limits of grade crossing panels	
15. For each track curve provide track curve table with the following information. Track Curve number, PI stationing, Radius, Length of curve, Length of each spiral, Actual and unbalance superelevation and track design max speed.	

PROFILES

1. Existing ground shown and labeled	
2. Proposed track profile shown and labeled	
3. Show and label profile grid including elevations and stationing	
4. Label vertical curve points, including Beginning point (PVC), end point (PVT), length of curve, vertical curve PI and Low point	
5. Label vertical tangent grades	
6. Label special trackwork limits, turnout size, Point of switch and PITO.	
7. Show locations of proposed guideway including abutments, structure profiles and columns.	
8. Label platform limits and name.	
9. Label all station equations	
10. Show existing and proposed elevations on profile grind	
11. Locations of utilities conform to current proposed plans by utility designers and conform to clearance standards.	
12. Existing ground lines and ground elevations shown.	
13. Show and label roadway limits	
14. Dimension minimum vertical clearance from guideway structure to roadway	
15. Match lines compatible.	
16. Show 100 year or 500 year flood elevation	

TYPICAL SECTIONS

1. Track structure conforms to design standards.	
2. Typical section conforms to requirements and standard plans.	
3. Provide specifications for all materials shown on sections.	

4. Ensure typical section conforms to plan view.	
5. Stationing conforms to plans.	
6. Notes compatible with specifications.	
7. Typical sections available for all portions of track.	
8. Dimensions correct for typical section widths, thicknesses, slopes, ties, underdrains, geotextile fabric, barriers, fences, retaining walls, track centers and systems items.	
9. Show typical existing ground condition	
10. Depict typical location for all appurtenances, such as track drainage, OCS poles and foundations, track structure, lighting, walkways, standpipes, ductbank/raceway location and track guideway edge condition	
11. Provide notes for each appurtenance shown and where to locate details on the different appurtenances.	
12. Dimension clearances to crossing structures and roadways	
13. Clearance envelope and VDE are shown	
14. All guideway appurtenances shown within limits of section	
15. Emergency egress and walkway are shown along with Emergency egress clearance envelope.	

CROSS SECTIONS

1. Ensure information on cross section presented in standard, consistent format.	
2. Cross sections conform with typical sections.	
3. Cross sections developed at 50 ft intervals.	
4. Stationing and elevations conform to plan and profile.	
5. Scale consistent and conforms to standards.	
6. Sections provided for all proposed trackwork.	

OTHER

1. Construction phases delineated.	
2. Construction phasing plan provided if required.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: TRACK – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design Memo final.	
2. Technical memoranda have been submitted.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted	
2. Track Clearance envelope calculations	
3. Track Clearance envelope line defined and included in track plan	
4. Track spacing calculation	
5. Vertical overhead and under Clearance calculations	
6. Track Horizontal curve calculation	
7. Track Vertical curve calculation	
8. Overspeed calculation	
9. Bumping post calculation	
10. Track substructure ballast calculation	
11. High strength rail calculations (ductility, stiffness in relation to the structure)	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination items completed with all disciplines:	
a. Signals/Systems	
b. Overhead Catenary System (OCS)	
c. Traction Power	
d. Stray Current / Negative return	
e. Civil (Earthwork/Sitework)	

f. Roadway	
g. Utilities	
h. Drainage	
i. Mechanical (standpipe/fans)	
j. Structures – Tunnel, culverts, station, bridges, including preliminary rail/structure interaction analysis	
k. Structures – Retaining Walls, Ballast Retaining Walls, Barriers	
l. Architecture @ stations	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION GENERAL	Y/N
1. Design review comments addressed in submittal documents.	
2. Conforms to applicable codes, standards and design guidelines.	
3. Reviewed in accordance with QC Plan.	
4. Staff briefed on QC requirements.	
5. Cost estimates completed.	
6. Drawings conform to Design Technology Manual.	
7. Title, sheet name and sheet number on each sheet.	
8. North arrow on each sheet at correct orientation.	
9. Scale(s) called out and scale bar(s) on each sheet.	
10. Project number on each sheet.	
11. Positive versus negative numbers confirmed.	
12. Spelling, punctuation and grammar correct.	
13. Verify all drawings references are correct	

TRACK CHARTS

1. Illustrate and label all rail types and limits	
2. Contract limits shown	
3. Illustrate and label all IJ locations	
4. Illustrate Horizontal alignment per Design Technology Manual	
5. Illustrate Vertical Alignment (control track only) per Design Technology Manual	
6. Illustrate and label Hi-rail access, grade crossings and Emergency egress crossing, rail lubricators, Link rail stations.	
7. Define limits of each track structure type (Ballasted, Direct Fixation, Embedded track, etc)	

8. Provide drawing reference for each track type	
9. For each track curve provide track curve table with the following information. Track Curve number, PI stationing, Radius, Length of curve, Length of each spiral, Actual and unbalance superelevation and track design max speed.	
10. Label Milepost 1/10 th MP's in profile for control track	

ALIGNMENT DATA TABLES

1. Point of Beginning and Point of Ending defined	
2. Label all Station equations	
3. Label each Curve number	
4. Label each Curve alignment point designation type defined by type, station, Northing and easting coordinates. Including the PI point information	
5. Label the curve data including circular and spiral curve elements. (such as Delta angle, Delta Curve angle, Tangent curve Length, Tangent spiral length and Theta Spiral angle)	

SPECIAL TRACKWORK DATA TABLES

1. Label each Turnout size and type (LH/RH/EQ) track designation	
2. Label Point of switch (PS) and PITO for each Turnout, including Stationing, Northing and Easting	

PLAN AND PROFILES

GENERAL DATA

1. Locations of existing features conform to documentation provided.	
2. Property, Transit way and Right of way lines shown	
3. City limits shown	
4. Linework and symbols conform to legend.	
5. Abbreviations per legend.	
6. No utility conflicts.	
7. References to sections, other drawings or notes correct.	
8. All proposed features located.	
9. Tracks properly labeled.	
10. Label typical section and track type limits (include track stationing)	

PLAN

1. Track centers conform to criteria.	
2. Label track centerlines with track number, stationing, station equations and curve numbers.	
3. Critical horizontal clearances called out including at curves, retaining walls, structures, station platforms and untypical situations.	
4. Label roadway centerlines and road names/numbers.	
5. Label alignment point designations such as PC, PT, TS, SC, CS and ST	
6. Match lines compatible	
7. Label limits of ballast mat	
8. Label begin and end of platform limits.	

9. Guideway structures are shown including Bridges, tunnels, abutments, approach slabs, track transition slabs and walls.	
10. OCS pole locations shown	
11. Work to be done by others called out.	
12. Removals shown and salvaged materials covered by notes or specifications.	
13. Show limits of High rail access locations	
14. Show limits of grade crossing panels	
15. For each track curve provide track curve table with the following information. Track Curve number, PI stationing, Radius, Length of curve, Length of each spiral, Actual and unbalance superelevation and track design max speed.	

PROFILES

1. Existing ground shown and labeled	
2. Proposed track profile shown and labeled	
3. Show and label profile grid including elevations and stationing	
4. Label vertical curve points, including Beginning point (PVC), end point (PVT), length of curve, vertical curve PI and Low point	
5. Label vertical tangent grades	
6. Label special trackwork limits, turnout size, Point of switch and PITO.	
7. Show locations of proposed guideway including abutments, structure profile and columns.	
8. Label platform limits and name.	
9. Label all station equations	
10. Show existing and proposed elevations on profile grind	
11. Locations of utilities conform to current proposed plans by utility designers and conform to clearance standards.	
12. Existing ground lines and ground elevations shown.	
13. Show and label roadway limits	
14. Dimension minimum vertical clearance from guideway structure to roadway	
15. Match lines compatible.	
16. Show 100 year or 500 year flood elevation	

TYPICAL SECTIONS

1. Track structure conforms to design standards.	
2. Grammar and spelling correct.	
3. Typical section conforms to requirements and standard plans.	
4. Specifications exist for all materials shown on sections.	
5. Ensure typical section conforms to plan view.	
6. Stationing conforms to plans.	
7. Notes compatible with specifications.	
8. Typical sections available for all portions of track.	
9. Dimensions correct for typical section widths, thicknesses, slopes, ties, underdrains, geotextile fabric, barriers, fences, retaining walls, track centers and systems items.	
10. Show typical existing ground condition	

11. Depict typical location for all appurtenances, such as track drainage, OCS poles and foundations, track structure, lighting, walkways, standpipes, ductbank/raceway location and track guideway edge condition	
12. Provide notes for each appurtenance shown and where to locate details on the different appurtenances.	
13. Dimension clearances to crossing structures and roadways	
14. Clearance envelope and VDE are shown	
15. All guideway appurtenances shown within limits of section	
16. Emergency egress and walkway are shown along with Emergency egress clearance envelope.	

CROSS SECTIONS

1. Ensure information on cross section presented in standard, consistent format.	
2. Cross sections agree with typical sections.	
3. Cross sections included for all graded areas.	
4. Stationing and elevations conform to plan and profile.	
5. Scale consistent and conforms to standards.	
6. Sections provided for all proposed trackwork.	

OTHER

1. Construction phases delineated.	
2. Construction phasing plan provided if required.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: TRACTION ELECTRIFICATION – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build).	
2. Technical memoranda, if needed, have been drafted.	
3. Preliminary Load Flow Analysis report drafted.	
4. Design Identifies Interface Control Document (ICD) requiring input from design.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Power Utility requirements.	
2. DC duct bank placement.	
3. Initial structural requirements.	
4. Clearances identified and confirmed against all fixed structures and track.	
5. Preliminary Load Flow Analysis.	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified, e.g. utility requirements, grounding grid, TPSS Vault (if required), manhole and handhold locations, utility conflicts, access.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. E.g. Conduit routing	
2. Interdisciplinary coordination initiated and included: <ul style="list-style-type: none"> a. Coordination with system wide electrical, particularly for anticipated construction sequence and structural penetrations. 	
3. Preliminary Equipment Layout such as sump pump and TPSS vault drainage	
4. Preliminary TPSS site plans	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline Specifications	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. General notes identify applicable design codes and criteria	
2. TPSS Foundation elements shown with expected dimensions. Floor and roof plans, elevations, and sections show general geometry, sizes, and types of major structural elements. TPSS preliminary size identified.	
3. Preliminary TPSS site plans	
4. Preliminary TE duct bank routing	
5. Single line schematic	
6. Preliminary OCS layout plans	
7. Preliminary OCS master overlap charts	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: TRACTION ELECTRIFICATION – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo has been updated.	
2. Traction Power Load flow analysis report has been updated.	
3. Grounding layout calculations and details Technical Memoranda has been drafted.	
4. OCS clearance with all fixed structures and track report.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Traction Power Load flow analysis.	
2. Grounding layouts, details and calculations.	
3. OCS pole and foundation calculations.	
4. TPSS foundation calculations.	
5. Traction power conduit fill calculations.	
6. Battery sizing calculations.	

D. Constructability

ACTION	Y/N
1. Final potential constructability issues identified, e.g. utility requirements, grounding grid, TPSS Vault (if required), manhole and handhold locations, OCS clearance.	
2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
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1. Critical interdisciplinary coordination issues resolved.	
2. Interdisciplinary coordination included: a. Coordination with system wide electrical, particularly for anticipated construction sequence and structural penetrations. b. Coordination with Mechanical and Civil regarding TPSS vault.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. General TPSS Notes, Abbreviations, and Legends	
2. Key Plan	
3. System Single-Line diagrams	
4. TPSS DC cable layouts	
5. DC feeder schedules created to coordinate with Civil/System Integration	
6. TPSS site layout includes vault, ground grid and conduit routing	
7. Preliminary traction power duct bank/conduit layout	
8. Preliminary traction power duct bank schedule	
9. TPSS one-line diagrams	
10. Transfer Trip Schematic Diagrams	
11. Emergency Trip Station (ETS) Control schematic Diagrams	
12. Typical Control Power schematic & AC/DC Panel Schedules	
13. DC Disconnect Switch Pad-mounted One-line Diagram & Control Wiring Schematic.	
14. TPSS LCMS configuration diagrams	
15. TPSS LCMS HMI views	
16. TPSS SCADA point list	
17. TPSS equipment layouts including exterior & interior elevation Details	
18. TPSS Basement Equipment layout & Elevation	
19. TPSS platform and Stair Details	
20. TPSS grounding layouts and details	

21. DC Disconnect Switch Pad-Mounted Cabinet Assembly Details	
22. TPSS LCMS Cabinet Assembly Details	
23. TPSS Rail to Ground Device Assembly Details	
24. Fire Control Room ETS Cabinet Assembly Details (if applicable)	
25. Fire Control Room ETS Installation and Signage Details (if applicable)	
26. General OCS Notes, Abbreviations, and Legends	
27. Key Plan	
28. OCS layout plans and preliminary schedules	
29. OCS final master overlap charts	
30. OCS general arrangements	
31. OCS Structure Erection Diagram (site specific termination height, mounting orientation & bracket heights)	
32. OCS technical sheets	
33. OCS Tie-In Plans	
34. OCS Technical Drawings	
35. OCS Pole assemblies	
36. OCS Wire Support Assemblies	
37. OCS Miscellaneous Assemblies	
38. OCS Terminations and Down guy Assemblies	
39. OCS Site Specific Cross Section Assemblies (if applicable)	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: TRACTION ELECTRIFICATION – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo final.	
2. Technical memoranda have been submitted.	
3. Traction Power Load flow analysis report has been submitted.	
4. Final OCS clearance with all fixed structures and track report, if identified.	
5. Design incorporates disposition of resolved ICDs. Respond to ICDs requiring input from design.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Final Traction power load flow analysis - complete and submitted.	
2. Grounding layouts, details and calculations - complete and submitted.	
3. TPSS foundation calculations – complete and submitted.	
4. OCS pole and foundation calculations – complete and submitted.	
5. Traction power conduit fill calculations - complete and submitted.	
6. Battery sizing calculations - complete and submitted.	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved e.g. utility requirements, grounding grid, TPSS Foundation/Vault (if required), manhole and handhold locations.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete and includes structural penetrations by other disciplines.	
2. Interdisciplinary review included: <ul style="list-style-type: none"> a. Coordination with system wide electrical, particularly for anticipated construction sequence and structural penetrations. b. Communications and Civil systems integration. 	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. General TPSS Notes, Abbreviations and Legend	
2. Key Plan	
3. System single line diagrams	
4. TPSS one-line diagrams and transfer trip schematic diagrams	
5. Emergency Trip Station (ETS) Control schematic Diagrams	
6. Typical Control Power schematic & AC/DC Panel Schedules	
7. DC Disconnect Switch Pad-mounted One-Line Diagram & Control Wiring Schematic	
8. TPSS anchorage detail including basement equipment layout plan & elevation	
9. TPSS grounding layouts and details	
10. TPSS LCMS configuration diagram	
11. TPSS LCMS HMI views	
12. TPSS SCADA points list	
13. TPSS equipment layouts including exterior and interior elevations	
14. TPSS Platform & Stair Details	
15. DC Disconnect Switch Pad-Mounted Cabinet Assembly Details	
16. TPSS LCMS Cabinet Assembly Details	
17. TPSS Rail to Ground Device Assembly Details	
18. Fire Control Room ETS Cabinet Assembly Details (if applicable)	
19. Fire Control Room ETS Installation and Signage Details (if applicable)	
20. TPSS site plan and Cable Layout	
21. TPSS Cable Schedule (AC, DC positive & negative, Control)	
22. Traction power duct bank/conduit layout	
23. Traction power duct bank schedule	
24. DC feeder cable schedule	
25. General OCS Notes, Abbreviations, and Legend	
26. Key Plan	
27. OCS master overlap charts	
28. OCS layout plans and schedules	
29. OCS general arrangements	
30. OCS technical sheets	

31. OCS Structure Erection Diagram (site specific termination height, mounting orientation & bracket heights)	
32. OCS Tie-In Plans	
33. OCS Technical Drawings	
34. OCS Pole assemblies	
35. OCS Wire Support Assemblies	
36. OCS Miscellaneous Assemblies	
37. OCS Terminations and Down guy Assemblies	
38. OCS Site Specific Cross Section Assemblies (if applicable)	
39. OCS all special arrangements	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Updated and completed based on information provided in drawings.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: TRAIN CONTROL AND SIGNALS – PRELIMINARY ENGINEERING (30%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo has been drafted. (Final accepted if Design-Build)	
2. Technical memoranda	
3. System single line and initial control line operation.	
4. Headway calculation report.	
5. Narrative of how "new work" ties into existing work (if applicable)	
6. Proposed bungalow size.	
7. Diagnostic review for new or modify grade crossings.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Power Utility requirements.	
2. Signals duct bank placement.	
3. System single line and initial control line operation. Initial block design and definition.	

D. Constructability

ACTION	Y/N
1. Preliminary potential constructability issues identified, e.g. utility requirements, communications, sub system interface and handhold locations for connections to existing (as applicable).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Preliminary interdisciplinary coordination issues identified. e.g. Conduit routing	
2. Interdisciplinary coordination initiated and included: Coordination with system wide electrical, traction power, civil (track), SCADA and civil (grade crossing) particularly for anticipated construction sequence and structural penetrations.	
3. Preliminary Equipment Layout	

Description of interdisciplinary coordination efforts:

Identify civil areas of egress, walls and fences that could interfere with wayside signal equipment (i.e LRV signals, TWC loop, cab signal loops.

F. Specifications:

ACTION	Y/N
1. Outline specifications	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details have been started. General notes identify applicable design codes and criteria.	
2. Preliminary system single line track diagram.	
3. All subsystem block diagrams.	
4. Signal house site specific plans.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities:

ACTION	Y/N
1. Not applicable	

EP-03 CHECKLIST: TRAIN CONTROL AND SIGNALS – FINAL DESIGN (60%)

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo updated.	
2. Signals system control line diagrams (calcs related to the Tie-in to be included, Signal Route and Aspect Charts).	
3. Headway calculation report.	
4. Signal equipment power distribution single line diagrams.	
5. Equipment layout schematics	
6. Equipment layout plans (composite for all systems layout plans).	
7. Signal Equipment Foundation.	
8. <u>All typical and special details for Signals installation.</u>	
9. Product Submittals for all Signal products identified in the specs.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Signals system control line diagrams (calcs related to the Tie-in to be included, SIG Route and aspect charts).	
2. <u>Signal approach locking times for interlocking and vent zone signals.</u>	
3. <u>Grade crossing warning times (if applicable)</u>	
4. Grounding layouts, details and calculations.	
5. Utility Requirements.	

D. Constructability

ACTION	Y/N
1. Final potential constructability issues identified, e.g. utility requirements, grounding, Structural (if required), handhold locations.	

2. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	
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E. Interdisciplinary Coordination:

ACTION	Y/N
1. Critical interdisciplinary coordination issues resolved.	
2. Interdisciplinary coordination included: <ul style="list-style-type: none"> a. Coordination with system wide electrical, traction power, civil (track), SCADA and civil (grade crossing) particularly for anticipated construction sequence, bungalow site layouts, and structural penetrations. 	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

G. Drawings:

ACTION	Y/N
1. Product submittals and specifications updates.	
2. Signals system control line diagrams.	
3. Signal single line drawings.	
4. Signal double line drawings.	
5. Signals Grounding layouts and details	
6. Signals cable layouts Cable Plan schedules created to coordinate with Civil/System Integration.	
7. Signals equipment layouts, schematics, and plans	
8. Signals site layout including structural (if applicable), ground grid and conduit	
9. Signal house locations and access requirements	
10. Interlocking layout coordinated with trackwork, walkways, and snow meter cases	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
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1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	

EP-03 CHECKLIST: TRAIN CONTROL AND SIGNALS – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of design memo final.	
2. Technical memoranda have been submitted.	
3. Signals system control line diagrams,	
4. Signals route and aspect charts.	
5. Headway calculation report.	
6. Signal equipment power distribution single line diagrams.	
7. Signal equipment foundation details.	
8. Signal equipment layout plans, and foundation details.	
9. All typical and special details for Signals installation.	
10. Updated grade crossing diagnostic review.	
11. Train control system related calculations complete and stamped.	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted Signals system control line diagrams (calcs related to the Tie-in to be included, Signal Route and aspect charts)	
2. Signal approach locking times for interlocking and vent zone signals.	
3. Grade crossing warning time calculations.	
4. Grounding layouts, details and calculations.	
5. Utility Requirements	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved e.g. utility requirements, grounding, Structural (if required), handhole locations.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Interdisciplinary coordination with other disciplines is complete and includes structural penetrations by other disciplines.	
2. Interdisciplinary review included: Coordination with system wide electrical, traction power, civil (track), SCADA and civil (grade crossing) particularly for anticipated construction sequence and structural penetrations.	

Description of interdisciplinary coordination efforts:

F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details completed.	
2. Product submittals and specifications updates. (Signals and communications)	
3. Signal single line drawings.	
4. Signal double line drawings.	
5. Signal single line map (Roll out map). (Include curve data, track construction, civil speeds, wayside equipment stationing, track circuits, switch nomenclature and elevation.	
6. Grounding layouts, details and calculations	
7. Signals cable layouts	
8. Cable plan schedules created to coordinate with Civil/System Integration.	
9. Signals Equipment layouts – Final	
10. Signal bungalow site layout including vault, ground grid and conduit	
11. Drawings are coordinated with the specifications: <ul style="list-style-type: none"> a. Terminology is consistent between the two documents. b. Specified materials and products are consistent between the two documents. 	
12. Conduit runs to all other systems infrastructure defined	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	

EP-03 CHECKLIST: TUNNELS – PRELIMINARY ENGINEERING (30% Design) FOR DESIGN-BID-BUILD,
PRELIMINARY ENGINEERING-RFP DEVELOPMENT (30% Design) FOR DESIGN-BUILD

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Preliminary Basis of Design memo. Includes recommendations for additional exploration required for final design such as building and utility protection – data collection required progress to 60% and 90% designs (including environmental parameters for service life prediction, such as pH, sulfate concentration level, resistivity, etc., for ground and groundwater)	
2. Preliminary Technical Memoranda have been submitted, reviewed, and approved. TMs include topics such as tunnel profile selection and cross passage construction methods, lining type, tunnel design and construction, shaft design and construction (if any), construction staging and easement requirements, soil disposal sites, and Support of Temporary Excavation	
3. Geotechnical– See Geotechnical checklist)	
4. Building and Adjacent Structure Protection (for design-bid-build project) - Adjacent structure information collection in progress and Performance Criteria being Established. Building and Adjacent Structure Protection (for design-build project)- a. Recommendations from building and utility protection reports generally incorporated in drawings, Specifications and Geotechnical Baseline Report (GBR). Proscriptive procedures called out with requirements specified, example – additional requirements for excavation support and dewatering, ground treatment or underpinning. Some may still be pending adjacent structure information collection. b. Begin obtaining Rights of Entry for known properties c. Performance Criteria established and agreed in writing with utility owners	
5. Risk register – including Regulatory/Legal/Permits, Commercial/Contractual/Financial, Design, Logistics/Access, Construction, Environmental, Safety & Security, and Others (if any).	
6. Tunnel Space Proofing Report – verify the proposed tunnel cross section can house all required equipment for tunnel operation, including tunnel fire/life/safety systems (including egress walkway, egress signage, standpipe, tunnel drainage, tunnel ventilation, etc.), electrical (including tunnel lighting), communication, traction power, signal, SCADA system, stray current, track, third party utilities.	

List proposed Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Preliminary calculations for tunneling and shoring related settlement to assess requirements for building and utility protection	
2. Preliminary calculations per Geotechnical discipline for seismic design	
3. Calculations include: Gravity, Seismic, and design for structural items not identified for deferred design.	
4. Calculations include preliminary excavation/initial support design, if applicable	
5. Tunnel (and shaft) lining thickness	

D. Constructability

ACTION	Y/N
1. Constructability issues identified, including development of preliminary Risk Register (see Reports for details)	
2. Preliminary Alignments meet Design Requirements Manual for tunnel construction (curve Radii, slopes etc.). Horizontal and vertical alignment established.	
3. Identify tunnel, Shaft Structures, portal trench drain and associated underground pumping station and low point pumping station as necessary, and Cross passage construction methods.	
4. Confirm the adequacy of staging area for construction, including access (truck routes) in and out of the site.	
5. Confirm power for Tunnel Boring Machine operation.	
6. Confirm groundwater and construction water discharge point/points.	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Review geotechnical reports and Civil plans and profiles, ROW requirements, and sufficiency of Construction Laydown area(s)	
2. Input and coordination for additional geotechnical investigation needed for Final Design	
3. Input and coordination with Utility group and Structures for additional inputs	
4. Inter and intra Interdisciplinary coordination is complete for Preliminary Submittal and includes tunneling related design elements by other disciplines, Geotechnical, Civil, Track, Mechanical, Fire/Life/Safety, Signal, Electrical, Traction Power, SCADA, Stray Current, Communication, Structural, and others.	
5. Interdisciplinary review includes: Tunneling review of non-tunnel specifications, including Geotechnical, Environmental, Structural/seismic criteria, Civil and ROW. Review General arrangement Civil plans to identify structures for building protection/grouting or obstructions such as tiebacks	

6. Identify 3 rd Party requirements coordination for structure and utility protection, monitoring instrumentation and thresholds.	
7. Identify specific permits required for tunnel crossings or work in other jurisdictions.	
8. Power availability and time to deliver (For TBMs and back up, ventilation Scrubbers, Cranes, etc.)	
9. Complete preliminary research on Soil Disposal locations.	
10. Identify Long lead programs such as materials testing and TBM procurement.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Outline project-specific Specifications	

G. Drawings:

ACTION	Y/N
1. Key plans and general arrangement with tunnel diameter and walkway dimensions indicated	
2. Tunnel and walkway plans are 30% complete with track offset and control data not complete.	
3. Tunnel Cross Passages (CP)– General Arrangement Plan, Locations, and Sections for Standard and CPs with Sumps included	
4. Tunnel Lining – Precast liner General Arrangement and Liner development plan. (indicates number of segments). For two-pass lining system, show initial ground support (including tunnel excavation line) and final cast-in-place concrete lining thickness.	
5. Tunnel Drainage layout and preliminary drainage details provided – indicate size of portal trench drains and underground pumping station if required, and low point pumping station (LPPS) if required (such as in river crossing situation)	
6. Seismic Sections (as required for fault crossing where permanent fault rupture is expected and special design and detailing is required.), Locations indicated on general arrangement plan	
7. Waterproofing membrane typical details (for two-pass tunnel lining and cut-and-cover structures)	
8. Areas requiring ground treatment and minimum limits identified on General Arrangement or other drawings (Civil). Dimensions may not be shown at 30%	
9. Geotechnical Instrumentation. Locations of zone of monitoring, instrumentation points indicated as details of instrumentation types identified in Specifications	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities:

ACTION	Y/N
1. Not applicable	
2. ROM cost estimate and construction schedule	

I. Workshops:

ACTION	Y/N
<p>1. Conduct 30% Design Workshops 20 working days after 30% design submittal.</p> <p>Agenda:</p> <ul style="list-style-type: none"> • Design methodologies • Construction methodologies • Review Risk Register <ul style="list-style-type: none"> ○ Focus on high risk items ○ Identify any potential unforeseen conditions, based on past construction experience in similar geological settings • Cost and schedule reviews • Items to be addressed in the 60% design phase 	

EP-03 CHECKLIST: TUNNELS –FINAL DESIGN (60%) FOR DESIGN-BID-BUILD

**ALSO USED FOR POST AWARD SUBMITTAL – PROJECT/ENGINEERING DETERMINES
DESIGN DEVELOPMENT % SUBMITTAL (FOR DESIGN-BUILD)**

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design updated.	
2. Reports identified in Preliminary Basis of Design such as building and utility protection, at 60% or Draft status	
3. Updates to Preliminary Technical memoranda	
4. Geotechnical- See Geotechnical checklist	
5. Building and Adjacent Structure Protection – a. Recommendations from building and utility protection reports generally incorporated in drawings, Specifications and Geotechnical Baseline Report (GBR). Proscriptive procedures called out with requirements specified, example –additional requirements for excavation support and dewatering, ground treatment or underpinning. Some may still be pending adjacent structure information collection. b. Begin obtaining Rights of Entry for known properties c. Performance Criteria established and agreed in writing with utility owners	
6. Durability Report – project-wise structural durability report and service life prediction to meet 100-year service life.	
7. Update Risk registry – including mitigations, responsible party, and risk owner.	
8. Conclude space proofing report	
9. Peer review 60% Design Reports	
10. Confirm 30% design comments been addressed.	

List all Requests for Deviation including approval status:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Update calculations for tunneling and shoring related settlement to assess requirements for building and utility protection	

2. Update calculations with Geotechnical discipline for seismic design for new information	
3. Calculations include: Gravity, Seismic, and design for structural items not identified for deferred design.	
4. Update calculations for changes in excavation limits/initial support design, if applicable	
5. Calculations for protection of utilities and adjacent properties as identified in Building and Utility Protection Reports	

D. Constructability

ACTION	Y/N
1. Constructability issues from 30% - resolution advanced	
2. Preliminary Risk Register updated, Risk Mitigations included in 60% Specs and GBR as identified. (See Reports B.7.)	
3. Revisions in Preliminary Alignments meet Design Criteria for tunnel construction (curve radii, slopes etc.)	
4. Review, Shaft and Cross passage construction methods given updated Geotechnical Data	
5. Peer reviews as required for 60% or identified for prior to 90% (See Reports B.9)	
6. Confirmation of: <ul style="list-style-type: none"> • Power availability and time to deliver (For TBMs and back up, ventilation Scrubbers, Cranes, etc.) • Complete research on Soil Disposal locations • Construction water (and groundwater) discharge location/locations • Durability requirements – Testing of materials may be on the order of a year 	
7. Complies with RFP requirements including ST approved construction sequencing (Design-Build only).	

E. Interdisciplinary Coordination:

ACTION	Y/N
1. Review updated geotechnical reports and Civil plans and profiles, ROW requirements, and sufficiency of Construction Laydown area(s)	
2. Results of additional geotechnical investigation reviewed and incorporated in Geotechnical Data Report (GDR) and designs as available	
3. Review existing conditions data with Utility group and structures disciplines - identify need for additional research	
4. Inter and intra Interdisciplinary coordination is complete for 60% Submittal and includes tunneling related design elements by other disciplines including mechanical, electrical, plumbing/fire protection, traction power, communication, SCADA, signal, stray current, track, Geotechnical, Civil (survey) and Structural.	
5. Interdisciplinary review includes: Tunneling review of non-tunnel specifications, with attention paid to Geotechnical, Environmental, to Structural/seismic criteria, Civil and ROW, Review General arrangement Civil plans and profiles to indicate structures for building protection/grouting or obstructions such as tiebacks and exiting	

foundations. Updates for additional information provided by subsequent investigations and research.	
6. 3 rd Party requirements coordination for structure and utility protection, monitoring instrumentation and thresholds – Utility Drawings reviewed by 3 rd party owners to confirm completeness of information and distortion thresholds	
7. Status of special permits: updated with schedule for approval. Clear responsibility for obtaining permit(s) identified and work towards requirements in progress.	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Specifications developed, refined, and coordinated with the drawings.	
2. Requests for modification of the ST Standard Specifications submitted.	

List any modification requests for ST Standard Specifications:

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G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are included Include legend of abbreviations and symbols General notes identify applicable design codes and criteria, geotechnical parameters used in design, materials, design loads, construction and/or fabrication requirements and limitations, deferred and/or special submittals, instrumentation, testing and inspection requirements, observations, etc.	
2. Key plans and general arrangement with tunnel diameter and walkway dimensions indicated	
3. Tunnel and walkway plans are 60% complete with track offset and control data indicated.	
4. Tunnel Cross Passages (CP) – General Arrangement Plan and Sections for Standard CPs and CPs with Sumps, drain pipes, vents, emergency stairs complete	
5. Typical Sections – Tunnels and Cross passages in progress	
6. Tunnel Lining – Precast liner General Arrangement and Liner development plan included. (indicates number of segments)	
7. Drawings added include Precast Concrete or Steel Segments ring geometry, general arrangement, reinforcing, tolerances, gasket and connection details to 60%	
8. Tunnel Drainage – Cross-passages sumps, including Electrical, and Mechanical	
9. Seismic Sections (as required), Locations indicated, details in progress	
10. Waterproofing membrane typical details	

11. Areas requiring ground treatment and minimum limits identified on General Arrangement or other drawings (Civil) Minimum dimensions shown	
12. Geotechnical Instrumentation (may be duplicated with Geotech section). Locations of Zone of monitoring, instrumentation points indicated as details of instrumentation types identified in Specifications	
13. As applicable, temporary structures designed and detailed such as grouting or breakouts from shafts. Shafts shown in profile with sized structural elements.	
14. Stray current monitoring/mitigation elements	
15. As applicable, temporary structures such as access shafts indicated. Other required designs included such as grouting or breakouts from shafts to 60%	
16. Confirm 30% design comments been addressed.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

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H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Developed based on information provided in drawings.	
2. Quantities provided to Project Manager for ICE development / update.	
3. Update 30% design cost and schedule	

I. Workshops:

ACTION	Y/N
1. Conduct 60% Design Workshops 20 working days after 60% design submittal. Agenda: <ul style="list-style-type: none"> • Design update • Construction methodologies • Review Risk Register <ul style="list-style-type: none"> ○ Focus on high risk items ○ Identify any potential unforeseen conditions, based on past construction experience in similar geological settings • Cost and schedule reviews • Items to be addressed in the 90% design phase 	

EP-03 CHECKLIST: TUNNELS – FINAL DESIGN (90% and 100%)

A. Project:

Contract Number & Project Name/Location:
Discipline DOR Name & Date:

B. Reports:

ACTION	Y/N
1. Basis of Design memo final	
2. Technical memoranda have been updated.	
3. Geotechnical Baseline Report has been submitted, reviewed and approved by Tunneling Group, and constructability group including contracts and cost estimating.	
4. Baselined items reviewed against standard references such as ASCE guidelines.	
5. Update risk registry	
6. Peer review 90% Design Reports	
7. Confirm 60% design comments been addressed	

List all approved Requests for Deviation, if any:

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List Technical memoranda, if any:

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C. Calculations:

ACTION	Y/N
1. Calculations complete and submitted	
2. Calculations include: tunnel and shaft, Gravity, Seismic, and design for structural items not identified for deferred design.	
3. Calculations include excavation/initial support design, if applicable	
4. Calculations for protection of utilities and adjacent properties as identified in Building and Utility Protection Reports	

D. Constructability

ACTION	Y/N
1. Previously identified constructability issues resolved	
2. All tunneling risks from Risk Register addressed in contract (Specs/Drawings/GBR/GRs or other) (See Reports B.5 also)	
3. Peer Review of GBR, Drawings, Tunneling Specifications by Contractors/specialists for unusual/complex tunnel conditions, including geology and adjacent structures, bid uniformity. Schedule impacts due to specific tunneling conditions identified (See Reports B.6 also)	

4. Review of tunneling Specs, Drawings and GBR by Cost Estimators and those preparing the Bid forms/quantity takeoffs and Special Conditions. Review to include baseline quantities and statements, and impact on cost.	
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E. Interdisciplinary Coordination:

ACTION	Y/N
1. Inter and intra Interdisciplinary coordination is complete and includes tunneling related design elements by other disciplines, Geotechnical, Civil, Drainage, electrical, Mechanical, fire/life/safety, track, signal, SCADA, traction power, communication, signal, stray current, Structural, etc.	
2. Interdisciplinary review includes: Tunneling review of non-tunnel specifications, with attention paid to Geotechnical, Environmental, to Structural/seismic criteria, Civil and ROW	
3. 3 rd Party requirements coordination for structure and utility protection, monitoring instrumentation and thresholds.	
4. Utility owners have reviewed plans for completeness of existing information and requirements for additional protection during tunneling or other excavations	
5. Permits required from other agencies for tunneling such as DOT or Water obtained or in place pending Contractors final construction methods	
6. Confirmation of: <ul style="list-style-type: none"> • Power availability and time to deliver (For TBMs and back up, ventilation Scrubbers, Cranes, etc.) • Noise controls and work hour restrictions for tunnel sites • Over-Load permits for TBMs transported on streets – coordination with City agencies approving for criteria minimum • Soil Disposal locations identified and confirmed will accept materials • Construction discharge location/locations • Durability requirements 	

Description of interdisciplinary coordination efforts:

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F. Specifications:

ACTION	Y/N
1. Comments from previous submittals resolved and incorporated where necessary.	
2. Incorporate all approved ST Standard Specification modification requests.	
3. Specifications complete and coordinated with the drawings.	

G. Drawings:

ACTION	Y/N
1. Symbols, Abbreviations, General Notes, and Typical Details are complete Include legend of abbreviations and symbols	

General notes identify applicable design codes and criteria, geotechnical parameters used in design, materials, design loads, construction and/or fabrication requirements and limitations, deferred and/or special submittals, instrumentation, testing and inspection requirements, observations, etc.	
2. Key plans and general arrangement plans are complete, fully annotated, and referenced	
3. Tunnel and walkway plans are complete with track offset and control data complete, including stationing.	
4. Tunnel Plans and General Arrangement plans at Cross passages complete	
5. Typical Sections – Tunnels and Cross passages complete and detailed.	
6. Tunnel Lining – Precast Concrete or Steel Segments are complete and detailed including notes, ring geometry, general arrangement, reinforcing, welding details, tolerances, gasket and connection details, and any other construction requirements for handling or stacking segments that are not included in the Specifications.	
7. Cross passage plans, sections and reinforcing details	
8. Cross passage Layouts with sumps (as required) and drainage are complete and referenced	
9. Cross-passage breakout details as required	
10. Seismic Sections (as required), seismic joints, related detailing complete	
11. Waterproofing membrane and compartments (as required), details at tunnel interface	
12. Areas requiring ground improvement and/or treatment and minimum limits identified on General Arrangement or other drawings (Civil)	
13. Geotechnical Instrumentation (may be duplicated with Geotech section). Locations of Zone of monitoring, instrumentation points indicated as details of instrumentation types identified in Specifications	
14. As applicable, temporary structures such as access shafts indicated. Other required designs included such as grouting or breakouts from shafts	
15. Stray current monitoring/mitigation elements finalized	
16. Drawings are coordinated with the specifications, building protection requirements, GBR, GDR and other design memoranda Terminology is consistent between documents Specified materials and products are consistent between all documents	
17. Tunnel Drainage – Cross-passage sumps, including Electrical, Mechanical, Plumbing/Fire Protection	
18. Confirm 60% design comments been resolved.	

Provide notes on the implementation of ST Standard or Guidance Drawings:

H. Building and Adjacent Structure Protection

ACTION	Y/N
1. Building and utilities requiring proscriptive procedures called out with requirements specified, example – ground treatment or underpinning.	

2. Record Drawings obtained for Adjacent structures and utilities included in Contract package	
3. Rights of entry obtained for installation of instruments, monitoring, or ground improvement.	
4. Performance Criteria Established	
5. Work Restrictions indicated	
6. Method of payment clear	

H. Quantities: (NOT NEEDED BY ST FOR DESIGN-BUILD)

ACTION	Y/N
1. Complete based on updated drawings and specifications.	
2. Updated quantities provided to Project Manager for ICE completion.	
3. Provide 90% design level cost estimate and schedule	
4. Identify bid items and bid schedule, including items for allowance, unit price, and lump sum.	

I. Workshops:

ACTION	Y/N
1. Conduct 90% Design Workshops 20 working days after 90% design submittal. Agenda: <ul style="list-style-type: none"> • Design update • Review Risk Register <ul style="list-style-type: none"> ○ Focus on high risk items ○ Identify any potential unforeseen conditions, based on past construction experience in similar geological settings • Cost and schedule reviews 	