

Region of Waterloo
Stage 1 Light Rail Transit Project

Schedule 15-2 Appendix U
Design Management

APPENDIX U

DESIGN MANAGEMENT

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APPENDIX U DESIGN MANAGEMENT

U.1 General Project Co Responsibilities

- (a) The Work shall be performed in accordance with the details as shown on the final design plans, Project specifications and Working plans prepared by Project Co, subject to the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction consultation and written comment.
- (b) Project Co shall have the sole responsibility to provide and complete a holistic, comprehensive, and fully functional set of design plans, Project specifications meeting National Master Specification criteria and working plans of such a nature to develop a finished product in accordance with the Project Agreement. Project Co shall verify all pertinent dimensions in the field prior to the commencement of design plans, Project specifications and Working plans. Review of Project Co's design plans, Project specifications and Working plans by the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction shall not relieve Project Co of the responsibility for the satisfactory completion of the Work.
- (c) All design plans, Project specifications and Working plans shall be subject to the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction consultation and written comments before beginning construction Work covered by the plans, and shall not be thereafter amended or altered without the prior approval of Project Co's designer, MQAQC, consultation and written comment by the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction.
- (d) Project Co's Work shall include all costs related to all design plans and working plans.
- (e) Project Co shall perform the following, at a minimum:
 - (i) Manage the design and design Quality Control (QC) and Quality Assurance (QA) of the Work.
 - (ii) Coordinate with and obtain all approvals from authorities having jurisdiction for temporary road diversions and detours, shutdowns, temporary diversions, utility relocations, temporary sidewalk closures, and pedestrian detours, and like matters.
 - (iii) Ensure Project Co's designer properly checks the designs of the Project and the Design Quality Control Manager (DQCM) certifies QC procedures in accordance with the Project Agreement.
- (f) The procedures for checking the design of permanent components shall also apply to the design of temporary components and construction sequences especially those that affect the permanent components of the Project.

- (g) Project Co shall consider Appendix U and Schedule 10 complimentary to one another as well as Schedule 15-2 Design and Construction Performance Output Specifications, Schedule 15-3 Maintenance and Rehabilitation Specifications and Schedule 15-4 Operations Specifications. In addition, Project Co shall consider Appendix U and Schedule 10 complimentary to other Project Agreement Schedules not cited or referenced herein. Further, Project Co shall not consider Appendix U as taking precedence over any Schedule or Article within the Project Agreement. However, the Project Agreement hierarchy of legal precedence in the case of conflicting or similar language shall be utilized to determine which Schedule or Article takes precedence.
- (h) Project Co shall demonstrate by describing and providing with its Proposal Submission its approach to Schedule 10 Review Procedures and Appendix U Design Management. In addition, a Submittal Register and Submittal Check List for the first one hundred twenty calendar (120) days of Design Management taking into consideration the requirements of Schedule 10 and Schedule 11 Quality Management along with sufficient narrative to explain its approach to Design Management. Further, it is imperative Project Co demonstrate to the Region in its Proposal Submission a clear understanding of their proposed design and design quality initiatives and commitment required under the Project Agreement.

U.2 Project Co's Design Organization and Obligations

- (a) Designer
- (i) Project Co's designer shall be a suitable, well qualified and experienced designer in similar Work with that of the Project, which may be a consultant or an in-house design team, to undertake the design of the permanent components and the temporary components of the Project. Project Co shall require the designer to have or establish an office in the Project vicinity and maintain all necessary representation throughout the duration of the Project Agreement to ensure the designer can meet all its obligations under the Project Agreement.
- (b) Location of Project Co's Designer
- (i) It is preferred Project Co's designer perform production design Work in the Project's vicinity. However, at a minimum, the design personnel designated in Project Co's Request for Qualification (RFQ) submission shall be in the Project vicinity for the duration of the Project's design.
- (c) Completeness of Design
- (i) Designer shall determine the following at a minimum:
- A. Effects of all loading requirements;
 - B. Dimensions of all elements;
 - C. Structural redundancies, where they exist;
 - D. Sub-soil interaction to support the loads from above;
 - E. Effects of seismicity;

- F. Effects of fatigue;
 - G. Durability and maintainability requirements;
 - H. Details of required QA/QC procedures, monitoring, and controls;
 - I. Effects of hydrology, design flows, and scour depths;
 - J. Temperature;
 - K. Constructability of the design in conjunction with Project Co;
 - L. Survey control;
 - M. System work;
 - N. Railroad; and
 - N. Operations, maintenance, rehabilitation and service life.
- (ii) Design will be considered complete upon the Region's Design Acceptance following the submittal and review of the Record Drawings.
- (d) Chief Engineer
- (i) Project Co's designated and submitted Chief Engineer from the Region's Request for Qualifications (RFQ) to manage all Work performed by Project Co's designer shall be in the Project vicinity as required for the design Work and shall be present as required thereafter to manage design support during construction, design changes, and completion of Record Drawings.
 - (ii) Project Co's Chief Engineer and/or staff working under the direct supervision of the Chief Engineer shall conduct an assessment and evaluation of the design such that the Chief Engineer can certify to Project Co and to the Region the design satisfies the Project Agreement requirements, including the following minimum requirements:
 - A. Accuracy;
 - B. Adequacy;
 - C. Conformance to standards of practice;
 - D. Compliance with codes and standards;
 - E. Cost effectiveness;
 - F. Quality; and,
 - G. Fitness for purpose and/or function as specified and/or implied in the Project Agreement.
 - (iii) Project Co's Chief Engineer shall include such written certification for all Work being subjected to a Design Review in accordance with the Project Agreement.
 - (iv) Chief Engineer's duties and work activities shall include, as a minimum, assessment and evaluation of the following:
 - A. Design reports;

- B. Analytical approach;
 - C. Drawing details for conformity to Project Agreement requirements;
 - D. Project specifications for conformity to Project Agreement requirements;
 - E. Design and working plans;
 - F. Major temporary components' effect on permanent components;
 - G. Field design changes including Project Co Request for Information, Project Co field material changes from approved Specifications, Project Co field phasing, sequence and staging changes from approved Designs and like matters;
 - H. Design approvals for materials and procedures; and
 - I. Record Drawings for conformity with final design and Project Agreement.
- (e) Responsible Engineer or Architect
- (i) Project Co shall provide the designated Project Co RFQ Responsible Engineer or Architect including Project Co designated Design Units or sub-units. The designated Responsible Engineer(s) or Architect(s) shall sign and seal design reports, design and working plans, and Project specifications for the assigned Design Unit(s). All Responsible Engineers or Architects shall be licensed Professional Engineers or Architects in the Canadian Province of Ontario.
 - (ii) Responsible Engineers or Architects shall be in the Project vicinity, as necessary, to coordinate the Work on assigned Design Units. The Responsible Engineer or Architect shall be present in the Project area for, and shall attend all Design Reviews for, assigned Design Unit(s).
- (f) Design Quality Control Manager (DQCM)
- (i) Project Co shall assign a Design Quality Control Manager (DQCM). The DQCM shall report to the Project Co's Manager of Quality Assurance and Quality Control (MQAQC).
 - (ii) The DQCM shall be responsible for the Quality Control (QC) of all Work conducted by the designer. The DQCM shall be in the Project vicinity, as required, throughout the design process and present, as required, thereafter to manage design QC related to design support during construction, design changes, and completion of Record Drawings and Record Documents.
 - (iii) Project Co's DQCM shall assess and evaluate Project Co's design QC activities in order to be able to certify to Project Co, MQAQC, and to the Region the design QC activities comply with the Schedule 10 Review Procedures, Quality Plan and Project Agreement requirements.
 - (iv) Project Co and MQAQC shall ensure the DQCM carries out all duties expressed and implied in the Project Agreement.
 - (v) DQCM shall have QC responsibilities including but not limited to the following, at a minimum:

- A. Design of permanent and major temporary components including but not limited to all data, design, reports, specifications, plans, working drawings, and TCP's;
 - B. Changes in design of permanent components including but not limited to all data, design, reports, specifications, plans, RFIs, working drawings, TCP's; and
 - C. Record Drawings and Record Documents.
- (vi) DQCM shall also perform, including but not limited to, the following minimum activities:
- A. Identify and report non-conformities/non-compliance;
 - B. Track, monitor, and report on status of outstanding design-related non-conformance reports;
 - C. Supply monthly report;
 - D. Safety Certification of the System including all System Integration requirements, system testing verification, Checklist Requirements; and
 - D. Submit specified certificates (permanent components and major temporary components).
- (g) Check by the Designer
- (i) The requirement that the Project Co engage and use a DQCM shall not relieve the designer from carrying out all the checks and reviews a professional and prudent designer would normally carry out on the type of Work actually being designed.

U.3 Design Units

- (a) Project Co shall package all design and drawings for the Work into separate manageable Design Units. Each Design Unit shall comprise similar and coherent significant parts of the Project that can be checked and reviewed as a self contained package with due consideration for accommodating interfaces with other Project components and subsequent Design Unit packages.
- (b) Within thirty (30) calendar days of Financial Close, Project Co shall provide a written report updating information submitted with Project Co's Proposal Submission and identifying each Design Unit. The written report shall include the following:
 - (i) Design Unit description, including scope of design Work within each Design Unit, including limits and interface points;
 - (ii) Planned review stages and dates with ties to the Project Schedule predecessor and successor activities, including specific information to be reviewed, planned review dates (measured from Financial Close) and percent complete represented by each review. All Project Schedule dates and ties shall include the fully resourced and cost loaded information;
 - (iii) Responsible Engineer or Architect; and

- (iv) Locations where design work will be performed.
- (c) Project Co shall submit to the Region in writing, City with prior Region concurrence, and agency having jurisdiction with prior Region concurrence for review and comment any revision Project Co makes to any and all information whether provided previously but not greater than concurrent with the Monthly Progress Report. Information requiring action on the part of the Region shall be submitted in writing immediately including information involving City and agency having jurisdiction decisions.

U.4 Relationship of Early Construction Starts to Design Development and Review

- (a) It is the intent of the Region to allow construction to begin on a Design Unit prior to completion of Final Design. Construction on any Design Unit may begin at any time after the applicable readiness for construction Design Review. Construction may progress in increments determined by Project Co, at Project Co's risk, provided each increment of construction is covered by drawings and specifications that have been reviewed and meet the requirements for readiness for construction. Project Co shall notify and keep the Region, designer, DQCM and Manager of Quality Assurance and Quality Control informed at all times with respect to Project Co's planning, phasing, scheduling, sequencing, and staging of the Work. Further, Project Co shall keep the Region informed of all design progress for each Design Unit on all Released for Construction (RFC) design documents Project Co intends to progress at risk.

U.5 Schedules for Design Checks, Reviews, and Submission of Checked Design

- (a) Project Co is solely responsible for scheduling and conducting Design Reviews to meet design and/or construction needs of the Project Schedule. It is recognized and anticipated the Design Review process and frequency, duration and intensity of Design Reviews may vary with the complexity of the individual Design Units and the associated construction activities. The duration of Design Reviews shall be discussed and mutually agreed between the Region and Project Co during the Commercial Confidential Meetings and submitted by Project Co within its Proposal Submission and Project Schedule. Any post Proposal Submission revision shall be submitted by Project Co and/or Region modified by mutual agreement during the course of the Project. Project Co shall provide written notice of any scheduled Design-Reviews to the DQCM, MQAQC, and Region a minimum of fourteen (14) calendar days prior to any review.
- (b) Project Co shall include with ties of predecessor and successor work activities the agreed to Design Review schedule for all Design Units (including their components and elements) as part of the Project Schedule. Project Co shall include with its Submission the first one hundred twenty (120) calendar days. The Design Review schedule shall be reviewed by Project Co during its Progress Meeting with the Region until design Work is complete. Project Co shall not schedule more than two (2) concurrent (concurrent means within two weekdays) Design Reviews for the same engineering/architectural disciplines or involving the same department of the Region. Project Co shall identify, as required, on its Design Review schedule for each Design Unit for resource planning by the Region. Where a respective City, Railroad and its tenants, agency having jurisdiction, or public

- and private Third Party Utility concurrence is required, Project Co shall also not schedule more than two (2) concurrent Design Reviews without the Region’s written concurrence.
- (c) Project Co shall provide within its Project Schedule [the required review time frames as per PA Section 20.3 \(h\) for Design Development Submittals](#) for each required Design Review for the Region, City, and public and private Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction of a Design Unit including each required resubmission of a Design Unit’s submission for Design Review. It is recognized that specific Project Co Design Reviews will be subject to durations that differ from the [PA Section 20.3 \(h\)](#) based upon the agency having jurisdiction. Project Co shall identify in its Proposal Submission and Project Schedule the number of planned Design Reviews for each Design Unit. Additional design review time may be required by certain agencies having jurisdiction and private entities. Project Co shall account for this additional time in its Project Schedule including any subsequent review.
- (i) City of Kitchener
- The following City departments within the City of Kitchener will be responsible for coordinating all reviews and comments on Project Co Design Units involving City of Kitchener infrastructure. They are Engineering Services, Kitchener Utilities, Transportation Planning, and Operations.
- (ii) City of Waterloo
- The City of Waterloo will provide the successful Proponent the departments responsible for coordinating all reviews and comments on Project Co Design Units involving City of Waterloo infrastructure.
- (d) Except for Record Drawings, “submissions” shall be in the form of sufficient copies [to accommodate participants in the Design Review(s)] of design plans and Project specifications and supporting data and reports assembled for review and submitted to the Region, respective City and public and private Third Party Utilities, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction. Project Co and the DQCM shall develop and prepare all forms and Submittal Checklists to be utilized by the Region, respective City, and public and private Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction during a Design Review.
- (e) Submittals shall be complete for each Design Unit, but may be combined for multiple Design Units at any one time upon the Region’s written concurrence. Project Co shall submit each Design Unit for consultation and written comment in accordance with the Project Schedule, Project Agreement and Schedule 10 Review Procedures.
- (f) For each Design Unit designated by Project Co, Project Co shall include design checks and Design Reviews and such additional reviews as they may arise at appropriate frequencies to progress the Work in an efficient and timely manner to meet the Project Agreement milestones. Project Co shall include Project Schedule time for the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming

formerly GEXR, GO, VIA, MTO, and agency having jurisdiction, as required, to participate and provide input to any Design Review conducted by Project Co's DQCM. Project Co shall incorporate this into Project Co's Project Schedule and report progress and updates in the Monthly updates. Project Co shall keep the Region up to date on exact timing of reviews and readiness for construction Design Reviews through the Progress Meetings with the Region.

U.6 Revisions to Design

- (a) Project Co shall deal with any and all changes to design initiated by the Project Co and already checked by the designer and certified by the DQCM as an entirely new design. Project Co shall not be entitled to any increase in the Project Agreement price or extension of time as a result of revisions to the design by Project Co.

U.7 Design Review Plan

- (a) Project Co shall prepare and submit a written Design Review Plan with its Proposal Submission and finalized plan sixty (60) calendar days from Financial Close for final consultation and written comment by the Region. The plan shall describe the level of design the designer will accomplish for each of the planned stages of design development including the resources for each planned stage of design development and provide a description and/or Submittal Checklist for each Design Unit clearly identifying the design product that will be reviewed. Statements of percent complete will not be acceptable.

U.8 Stages of Design Development

- (a) Project Co shall make a single comprehensive design check and Design Review for each Design Unit at the stages of design development specified herein.
- (b) The following are the five (5) stages of design development:
 - (i) Definitive Design;
 - (ii) Readiness for Construction or interim design;
 - (iii) Final Design;
 - (iv) Working Plans; and
 - (v) Record Drawings.
- (c) The intent of each stage of design development and Design Review is the following:
 - (i) Verify the design complies with the Project Agreement requirements;
 - (ii) Allow components of Design Units to be Released for Construction (RFC); and/or
 - (iii) In the case of reviews of working plans, to allow construction to continue.
- (d) Design Reviews or design checks shall be completed for each Design Unit (and for each component or element within a Design Unit) at each stage of design development including ties to the Project Schedule with resource and cost loaded data.

- (e) Project Co shall time the Design Review and Submittals (where specified) to be consistent with the Project Schedule.

U.9 Design Reviews

- (a) Project Co shall invite the Region to participate in definitive, readiness for construction, interim, final and working plan Design Reviews. The Region may invite other Project Stakeholders to participate. Project Co shall address and resolve the Region's, respective City, and public and private Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction comments in consultation with the Region. Project Co shall address and resolve all comments, and consistent with the Project Schedule, and construction work progress.

U.10 Definitive Design Review

- (a) The Design Review of a Definitive Design of a Design Unit shall be the first Design Review. The Definitive Design is intended to verify that the design concepts proposed by Project Co meet the Project Agreement requirements. The Definitive Design Review may also serve as a readiness for construction review. The Definitive Design Review shall verify the following:
 - (i) The design concepts governing future design development are defined consistent with Project Agreement requirements;
 - (ii) The final basic Project configuration;
 - (iii) The design concepts are substantiated and justified by adequate Project Site investigation and analysis;
 - (iv) Final Rights-Of-Way requirements;
 - (v) The specific standards applicable to the proposed concepts are identified and appropriate;
 - (vi) The proposed design concepts are constructible;
 - (vii) The availability of required materials/equipment; and
 - (viii) The design meets Project quality requirements and required design QC procedures have been followed.
- (b) If the Definitive Design is amended subsequent to the Definitive Design Review, Project Co shall re-check and re-certify the design as an additional Definitive Design Review. Project Co will not be entitled to an increase in the Project Agreement price or a time extension for the re-check and re-certification except when the amended design results from a Change Order or Variation to the Project Agreement as a result of a design change by the Region.
- (c) Readiness for Construction Review
 - (i) Project Co and the Region shall use the Design Review(s) of readiness for construction design to verify the concepts and parameters established and represented by Definitive Design are being followed and that the Project

Agreement requirements continue to be met. Project Co shall specifically highlight, check, and bring to the attention of the Region any changes to information presented at the Definitive Design. Project Co shall present the information for readiness for construction review to the Region and respective City as required, and where required to private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction for consultation and written comment. Project Co shall consider and discuss with the Region the pertinent subject matter and scope of work prior to involving the private and public Third Party Utilities, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction.

- (ii) Project Co shall not construct any permanent components or temporary components until the design checks, Design Reviews, and DQCM's certifications have been completed for the relevant Design Unit and the Region and respective City, as required, provide consultation and written comment of the design. Project Co shall consider and discuss with the Region the pertinent subject matter and scope of work prior to involving the private and public Third Party Utilities, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction.
 - (iii) Project Co shall not commence any construction until all design-related Non-Conformance Reports have been addressed and resolved.
 - (iv) If the readiness for construction design includes design information for Work that can be released for continuation of construction, the results of the readiness for construction Design Review, upon completion of Region and respective City, as required, consultation and written comment, may be used to satisfy a portion of the Project Agreement requirements. Project Co shall consider and discuss with the Region the pertinent subject matter and scope of work prior to involving the private and public Third Party Utilities, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction. Project Co shall be required to include those parties affected in this instance prior to release for construction.
- (d) Interim Reviews
- (i) If Project Co does not initiate construction on a designated Design Unit prior to 100% completion of the design, i.e. Final Design; Project Co shall plan and conduct at least one interim over the shoulder review between the Definitive Design Review and completion of design for that Design Unit. Project Co shall schedule such interim over the shoulder reviews at a time when design is at the 60% to 80% stage of completion.
 - (ii) Project Co and the Region shall use the interim Design Review(s) to verify that the concepts and parameters established and represented by Definitive Design are being followed and that the Project Agreement requirements continue to be met. Project Co shall specifically highlight, check, and bring to the attention of the Region any changes to information presented at Definitive Design. Project Co shall submit the interim design for consultation and written comment by the

Region and respective City, as required. Project Co shall consider and discuss with the Region the pertinent subject matter and scope of work prior to involving the private and public Third Party Utilities, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction.

(e) Final Design Review

- (i) Project Co shall schedule and conduct a final design review when the design plans and Project specifications for a Design Unit are 100% complete. Project Co shall specifically highlight, check and bring to the attention of the Region any changes to information presented at previous Design Reviews. Project Co shall submit Final Design for consultation and written comment by the Region and respective City, as required. Project Co shall discuss with the Region the pertinent subject matter and scope of work prior to involving the private and public Third Party Utilities, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction for their consultation and written comment.
- (ii) The Final Design Review, upon completion of Region consultation and written comment, may be used to satisfy a portion of the requirements of Readiness for Construction.

U.11 Working Plans

- (a) Working plans shall comprise the development and production of working drawings and plans with sufficient details, sections and views to demonstrate the proposed work to be performed within the individualized work plan including phasing, sequencing, staging, and temporary work. Project Co and DQCM shall check, review, and certify working drawings prior to their issuance and use during construction.
- (b) Project Co shall invite the Region and Stakeholders, when required, to participate in the review of all working plans. The Region will inform Project Co based upon the Project Co agenda which Stakeholders should participate in the reviews of working plans. The agenda by Project Co shall be provided a minimum of seven (7) calendar days prior to each meeting for review and comment by the Region.
- (c) Working plans include, but is not limited to, the following:
 - (i) Working drawings and plans including phasing, sequencing, staging, temporary work, Traffic Control Plans (TCP's) involving closures and detours;
 - (ii) Material and product data from fabricators, material men, manufacturers, suppliers, and vendors; and
 - (iii) Calculations and like data.

U.12 Record Drawing and Record Documents

- (a) Project Co shall submit Record Drawings for each Design Unit. Project Co and DQCM shall develop the requirements and procedures for all Record Drawings for review and comment by the Region. Project Co shall convene a meeting to review and dispose of all comments and to establish an agreed upon criteria for all Record Drawings and Record

Documents. Project Co shall tie the completion of all Record Drawings and Record Documents to the Project Schedule including the requirements of safety certification and pre-revenue training and testing. For greater clarity, Project Co shall provide Record Drawings and Record Documents with stamps and seals from the designated Responsible Engineer(s) or Architect(s). All Responsible Engineers or Architects shall be licensed Professional Engineers or Architects in the Canadian Province of Ontario.

(i) City of Kitchener and City of Waterloo

The City of Kitchener and City of Waterloo shall receive three (3) copies of the “Record Drawings” involving City of Kitchener and City of Waterloo infrastructure in a “DRAFT” form for review and comment. Project Co shall allow for thirty (30) working days, excluding holidays, of review by each respective City. All comments and requests shall be resolved by Project Co prior to the finalization of the “Record Drawings” upon receipt of each respective City comments. The Region will participate, as required, in the resolution of all comments and requests. Upon approval by each respective City, Project Co shall provide two (2) copies of all “Record Drawings”. All drawings shall be on mylars. All drawings formats shall be in accordance with the City of Kitchener and City of Waterloo standards for infrastructure owned by the respective City including any public Third Party Utility.

The City of Kitchener has additional requirements for documenting, recording and submitting as constructed Work information and data. Project Co shall comply with the required as constructed data submission requirements of the City of Kitchener by following:

<http://www.kitchener.ca/en/businessinkitchener/resources/ContructeAssetDataSubmissionManualNovember292012.pdf>

Project Co shall follow these same guidelines for the City of Waterloo unless otherwise directed or provided under current by-law, code, policy, regulation and standard by the City of Waterloo.

(ii) Railroad

Project Co shall comply with all CN, Genesee and Wyoming formerly GEXR, GO, and VIA Record Drawing and Record Document standards and submission requirements for all CN, GEXR, and GO and VIA asset and infrastructure.

(iii) MTO

Project Co shall comply with all MTO Record Drawing and Record Document standards and submission requirements for all MTO assets and infrastructure.

(iv) Private and Public Third Party Utility

Project Co shall comply with all private and public Third Party Utility Record Drawing and Record Document standards and submission requirements for the respective utility assets and infrastructure.

U.13 Design Checks, Certifications, and Reviews

- (a) Project Co’s design organization shall check all design documents (drawings including working drawings and details, plans, sketches, specifications, calculations, and reports) produced by Project Co’s designer. The DQCM shall certify these documents have been checked per the Project Agreement requirements and the Project Co’s Quality Plan. The DQCM’s written certification shall provide the certification required for design in accordance with the Project Agreement, Schedule 10, Schedule 11 and Schedule 15.
- (b) Project Co, the DQCM and the Region shall follow the process for Design Reviews developed and prepared by Project Co and the DQCM in accordance with the Project Agreement, Schedule 10, Schedule 11 and Schedule 15 requirements and applies to all Design Reviews except Record Drawing Design Reviews.
- (d) Project Co shall conduct and complete the design checks, certifications, and reviews for each Design Unit. The Region, respective City, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction will provide consultation and written comment of the design prior to Project Co releasing designs for construction. The Region may also issue design Non-Conformance Reports which shall be addressed and resolved to the satisfaction of the Region prior to releasing the design(s) for construction.
- (e) Project Co shall conduct its Design Review or submit its design for review in accordance with the Project Agreement supported by a written certification issued by the DQCM, at the stages of design development for each Design Unit in accordance with the Design Review schedule in the Project Schedule.

EXHIBIT U.13-1 - DESIGN CHECKS, CERTIFICATIONS, AND REVIEWS FOR PERMANENT AND TEMPORARY COMPONENTS

STAGE OF DESIGN DEVELOPMENT	DESIGN CHECK AND CERTIFICATION TO PROJECT CO	DESIGN REVIEW
Definitive Design	Designer and DQCM	Project Co, DQCM, Region, City, CN, GEXR, GO, VIA, MTO, and agency having jurisdiction
Interim Review(s)	Designer and DQCM	Project Co, DQCM, Region, City, CN,

EXHIBIT U.13-1 - DESIGN CHECKS, CERTIFICATIONS, AND REVIEWS FOR PERMANENT AND TEMPORARY COMPONENTS

		GEXR, GO, VIA, MTO, and agency having jurisdiction
Readiness for Construction design	Designer and DQCM	Project Co, DQCM, Region, City, CN, GEXR, GO, VIA, MTO, and agency having jurisdiction
Final Design	Designer and DQCM	Project Co, DQCM, Region, City, CN, GEXR, GO, VIA, MTO, and agency having jurisdiction
Working Plans and related documents	Designer and DQCM	Project Co, DQCM, Region, City, CN, GEXR, GO, VIA, MTO, and agency having jurisdiction
Record Drawing and Record Documents	Designer and DQCM	Project Co, DQCM Region, City, CN, GEXR, GO, VIA, MTO, and agency having jurisdiction
Major temporary components	Designer and DQCM	Project Co, DQCM, Region, City, CN, GEXR, GO, VIA, MTO, and agency having jurisdiction
Temporary components	Designer and checker	Where required and applicable by the appropriate entity

- (f) Project Co's Independent Design Checks
- (i) Project Co shall carry out independent design checks of permanent components, major temporary components, and effects of temporary components on the permanent components by senior engineers not involved in the production of the design being reviewed who have equal or greater qualifications and experience as the Responsible Engineer or Architect for the design being checked.
 - (ii) Independent design checks shall comprise design assessment and analytical checks as specified in the Project Agreement, Schedule 11 Quality Management and Schedule 15 requirements.
- (g) Design Assessment
- (i) Design assessment shall be the review of general compliance with the requirements of the Project Agreement, taking into consideration the proposed means and methods of construction, and shall cover the following areas at a minimum:
 - A. All loads and loading conditions including all railroads;
 - B. By-laws, codes and standards;
 - C. Methods of analysis;
 - D. Computer software and its validation;
 - E. Interface requirements including any temporary work to facilitate its means;
 - F. Maintenance and rehabilitation requirements;
 - G. Materials and Material properties including dissimilar material considerations;
 - H. Durability requirements;
 - I. Fatigue performance;
 - J. Hydrology;
 - K. Design flows; and
 - L. Operations and service life.
- (h) Analytical Check
- (i) The independent design check shall include an independent analytical check using separate calculations (and without reference to designer's calculations) to establish the structural adequacy and integrity of critical structural members. This shall include, but is not limited to, the following at a minimum:
 - A. The structural geometry and modeling;
 - B. Material properties;

- C. Member properties;
 - D. Loading intensities and applications; and
 - E. Structural boundary conditions.
- (i) Design Reviews
- (i) Project Co's time and cost impacts of revisions arising from Region and Stakeholder participation in Design Reviews and caused by Project Co's non-compliance with Project Agreement requirements, including the Region and Stakeholder's time for reviewing revisions, shall be borne by Project Co.
 - (ii) Design Reviews Conducted by Project Co's Design Quality Control Manager
 - A. Project Co shall notify and invite the Region to participate in all Design Reviews conducted by the DQCM. The Region may also invite Project Stakeholders and affected Utilities to participate. The Region will provide consultation and written comment (based on the Region and Stakeholder participation) regarding these Design Reviews.
 - B. For Design Reviews conducted by the DQCM, the DQCM shall provide a Design Review report for each Design Unit at the conclusion of each Design Review. The Design Review reports shall identify any actions arising from the review. The report shall note items requiring corrective action on the Design Non-Conformance Report. The DQCM shall send the Design Non-Conformance Report to Project Co, Project Co's designer and a copy to the Region.
 - C. Project Co shall conduct Design Reviews in the offices of Project Co in the Project vicinity. If the offices of Project Co's designer are reasonable close and in the vicinity of Project, Project Co may elect to have Design Reviews occur at the designer offices with the prior written concurrence of the Region. The Responsible Engineer or Architect and any specialists with significant input to the design or review shall be present. Project Co shall make available all drawings, copies of calculations, data, reports, or other items pertinent to the Design Review.
 - (iii) Record Drawing Review
 - A. Record Drawings, Project specifications and other pertinent Project Record Documents shall incorporate complete information that defines the Work as constructed to meet the Project Agreement requirements.
 - B. Project Co shall submit Record Drawings complete for each Design Unit to the Region, respective City, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction for review and Design Acceptance in accordance with the Project Agreement. The Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction review will be one of the processes to verify if the Project has been designed and constructed in accordance with Project

- Agreement requirements and to see if Record Drawings comply with Project Agreement requirements.
- C. Project Co shall make all corrections noted in the review of Record Drawings and resubmit the corrected Record Drawings to the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction, as required, for review and Design Acceptance.
 - D. Design Acceptance by the Region will not occur until the Record Drawings are submitted, reviewed and corrected to the satisfaction of the Region.
- (iv) Design Review of Major Temporary Components
- A. The DQCM shall conduct a Design Review of major temporary components that represent complex structures and that potentially can affect the safety, quality, and durability of the permanent components. The review shall include the effect of the major temporary components on the permanent components. Project Co shall invite the Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction, where applicable, to participate in the review. The Region may invite other affected Stakeholders to participate in the review(s) not noted.
- (v) Additional Reviews
- A. The Region (with Stakeholder participation, if invited by the Region) may conduct additional “over-the shoulder” reviews as considered necessary to ensure a continued and uniform consistency in the quality and effective incorporation of revisions to designs. Project Co shall also conduct reviews including “over-the shoulder” necessary to facilitate early release of designs for construction.
- (j) Readiness for Construction
- (i) Project Co may start construction of any element of the permanent components only after all the following items have occurred:
 - A. The designer has conducted its design QC checks throughout the design process in compliance with the Project Agreement, Schedule 10, Schedule 11 and certifies in writing the design is complete to the appropriate level or stage of review, checked and ready to be Released For Construction;
 - B. The DQCM has signed the title sheet for the drawings, certifying to the following (the title sheet can be formatted to include the items of certification):
 1. Design checks have been completed;
 2. Work conforms to Project Agreement requirements;

3. Any deviations or design exceptions have been approved in writing by the Region, City and agency having jurisdiction, where applicable;
 4. Design QC activities are following the Project Co's Quality Plan;
 5. All outstanding issues or comments from Design Reviews have been resolved; and
 6. All Non-Conformances have been documented and Corrective Action Plans have been implemented, verified and certified by the designer and DQCM.
- C. The Responsible Engineer or Architect has signed and sealed all drawings, Project specifications, calculations, and reports prepared under his/her direction. For those drawings and documents included in the submittal that are prepared by a fabricator, material men, manufacturer, supplier, or vendor, or other persons not under his/her direct supervision, the Responsible Engineer or Architect shall affix a stamp that indicates the design shown on the sheet or document conforms to the overall design and Project Agreement requirements;
- D. The Chief Engineer has signed the title sheet to the drawings, Project Specifications, calculations, and reports certifying to the items contained in the Design Unit conform to the Project Agreement. (The title sheet can be formatted to include the items of certification);
- E. Project Co has verified the following:
1. Design has undergone a constructability peer review and is constructible as represented;
 2. Design has undergone value engineering, where applicable, and Independent Design Check review ;
 3. Working plans, Project specifications and related documents or reports for the portion of the Project, i.e. Design Unit, to be constructed are complete and checked in accordance with the Project Agreement and quality plans.
 4. The design and drawings for Traffic Control Plan (TCP) and temporary erosion control and environmental measures applicable to the Work are complete, approved by the agency having jurisdiction, signed permits, where required; and
 5. Adequate stakes, lines, and/or monuments necessary to control the Work have been established on the Project site.
- F. The Region will provide consultation and written comment regarding the design and applicable TCP, temporary erosion control measures, and environmental requirements.
- (ii) The Region consultation and written comment will not constitute Approval or Design Acceptance of the design or subsequent construction.

- (iii) Any Design Non-Conformance Reports issued by the DQCM, MQAQC and/or the Region shall be addressed and resolved by Project Co with input from the Region prior to any design being Released For Construction.
 - (iv) Project Co may proceed with construction on the Project at Project Co's risk to the extent Work is covered by relevant design documents that have been processed in accordance with the Project Agreement, quality reviews and initiatives. Prior to construction proceeding further, Project Co shall complete the next stage of design and Design Review and/or submission.
- (k) Comment Resolution
- (i) Region and Stakeholder comments from Design Reviews will be recorded on forms developed and prepared by Project Co in accordance with the Project Agreement and transmitted to Project Co. Project Co shall record its proposed disposition and response to each comment and meet with the Region and respective Stakeholder and agency having jurisdiction with the Region present to resolve outstanding comments and dispositions. Final disposition and resolution will be documented on forms developed and prepared by Project Co in accordance with the Project Agreement.
 - (ii) If the design review reveals Non-Conformances with the Project Agreement requirements, the Region will prepare a Design Non-Conformance Report on forms developed and prepared by Project Co and submit it to Project Co for action. Project Co shall complete the Non-Conformance Report with its proposed Corrective Action and return the Non-Conformance Report to the Region. This shall continue until, with appropriate configuration management implemented, until the Corrective Action has been resolved.
 - (iii) All Design Reviews shall include a comment and Non-Conformance Report resolution process where unresolved comments and Non-Conformance Reports are discussed and a written action plan and schedule for resolution of unresolved comments and Non-Conformance reports is developed. The DQCM shall lead the process.

U.14 Design Exceptions

- (a) All deviations (design exceptions) from any specified standard shall be submitted to the Region for review and approval. All requests for deviations and exceptions shall be submitted with a justification report detailing the reasons to retain a non-standard or substandard feature or for providing an improvement that does not bring the feature up to standard. Requests for design deviations and exceptions shall be submitted not later than the Definitive Design Review and approved by the Region in writing before the affected Design Units will be Released for Construction.
- (b) All deviations (design exceptions) from any specified standard of the City of Kitchener, City of Waterloo, CN, Genesee and Wyoming formerly GEXR, GO, VIA, private and public Third Party Utility, MTO, or other governing body or agency having jurisdiction shall be submitted to the Region and agency having jurisdiction or party for review and approval. All requests for deviations and exceptions shall be submitted with a

justification report detailing the reasons to retain a non-standard or substandard feature or for providing an improvement that does not bring the feature up to standard. Requests for design deviations and exceptions shall be submitted not later than the Definitive Design Review and approved by the Region and agency having jurisdiction or party, as required, in writing before the affected Design Unit(s) will be Released for Construction.

U.15 Design Changes before Construction

- (a) Design changes may occur prior to construction or may occur after Final Design, and may be initiated by Project Co or the Region.
- (b) Design changes involving drawings and/or Project specifications, the designer shall prepare all required modifications or revisions to the drawings and Project specifications for review by Project Co and Region prior to implementing the changes. All design changes shall be required to undergo the Schedule 10, Schedule 11 and Appendix U review procedures included for original design documents in Project Co's Quality Plans prior to construction.
- (c) For all design changes requiring calculations, the designer and the DQCM shall conduct a documented check of all calculations. All design changes requiring alteration of design documents Released For Construction shall undergo all Schedule 10, Schedule 11 and Appendix U review procedures included for original design documents in the Project Co's Quality Plan.

U.16 Design Support during Construction

- (a) The designer and DQCM shall verify during construction that the conditions actually encountered are consistent with the design and related design plans, working plans, and Project specifications. The designer shall prepare the necessary adjustments in the design plans, working plans, and Project specifications, and Project Co shall obtain required Region, respective City, private and public Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction consultation and written comment among others not noted. Project Co shall be responsible for obtaining Stakeholder permits and approvals. Project Co shall include the time and cost to obtain all Stakeholder permits and approvals in its Submittals including any re-Submittals. The designer and DQCM shall check any such changes in accordance with the Quality Plan. The DQCM shall certify the change in writing as meeting the Project Agreement requirements. Project Co shall incorporate the adjustments in the Record Drawings. Project Co shall retain copies of the DQCM's written certifications and submit the certifications to the Region, and where required to the respective City, public and private Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction.

U.17 Design Workshop

- (a) Within forty-five (45) calendar days of Financial Close, Project Co shall arrange a design workshop to familiarize the designer's personnel and the Region (and Stakeholders, if invited) review personnel with the design concepts, issues, status, and review procedures. The Region and Project Co shall jointly develop the agenda of the workshop and how it

will be organized (i.e., by design unit and engineering discipline). The intent of the workshop is to make the subsequent design reviews more effective and efficient for all parties.

- (b) All agreements, schedules, and understandings reached during the design workshop shall be documented in writing and signed off by the Project Co's Project Manager and the Region Representative.

U.18 Quantity Estimates

- (a) To facilitate determining sampling and testing requirements and Monthly Schedule of Values for Payment, Project Co shall provide quantity estimates for the Work. The quantity estimates shall be in units that facilitate sampling and testing, i.e. the units shall be consistent with the units used to determine frequency of sampling and testing. For example, if "X" numbers of compaction tests are specified to be taken for every "Y" cubic meters of embankment, the quantity estimate would need to be in cubic meters of embankment.

U.19 Design Documentation

- (a) Progress Tracking
 - (i) Project Co shall include resource and cost loaded engineering and design progress and changes in its Project Schedule (including Work on any design change) in the Monthly Schedule Updates including Three Week Look Ahead's.
- (b) Design Quality Records
 - (i) DQCM shall prepare and submit monitoring reports to MQAQC and Region of all design issues and review comments resulting from the scheduled and additional checks and reviews, including "over-the-shoulder" reviews.
 - (ii) Project Co shall also maintain an auditable record of all Quality Plan procedures. An independent auditor shall be able to determine by reviewing documentation if all procedures included in the Quality Plan have been followed.
 - (iii) Project Co shall submit reports of checks and reviews within seven (7) calendar days of the completion of the review.
 - (iv) Project Co shall develop, implement, and maintain a log of design Non-Conformance Reports and/or notices indicating dates determined, date issued, reasons, status of Corrective Action and implementation resolution and date of resolution.
 - (v) Project Co shall prepare and maintain daily records of design activities on forms acceptable to the Region.
- (c) Design Quality Control Manager Reports
 - (i) Monthly Report to the MQAQC and Region

- A. DQCM shall submit a Monthly Report directly to the MQAQC and Region by the tenth day of the following month that includes the following, at a minimum:
 - 1. Summary of all reviews conducted;
 - 2. Non-Conforming work and current status and/or disposition (based on design non-conformance log; and
 - 3. Submittal(s) from Project Co and status including but not limited to Project Co's Submittal Register status including Project Schedule tied Submittals.
- (ii) Final Design Report
 - A. Upon completion of the final design for each Design Unit, including all its components and elements, the DQCM shall notify Project Co, with a copy to the Region and MQAQC, of all outstanding monitoring report issues or unresolved review comments, Non-Conformance Reports, Corrective Actions and implementations, and open Non-Conformance Reports. All comments, Non-Conformances, Corrective Actions and monitoring reports shall be resolved and closed prior to the completion of any final design for any Design Unit. No exceptions.

U.20 Design Plans, Working Plans, and Project Specifications

- (a) The Project Agreement price shall include the cost of furnishing all signed and sealed design plans, Project specifications, working plans, calculations, and reports and like data, and Record Drawings.
- (b) The Project Agreement establishes the minimum standards of quality and defines requirements that the design and construction shall satisfy.
- (c) During the design process, Project Co shall develop Project specifications and design plans based on the Project Agreement that are applicable to the specific materials, products, equipment, procedures, and methods Project Co intends to use. Project Co shall submit with its Submittal sufficient information to substantiate Project Co's approach to the Work.
- (d) During any Submittal and subsequent Design Review, the design plans and Project specifications will be evaluated by the Region to determine if they meet the Project Agreement.
- (e) Plans
 - (i) The Work shall be performed in accordance with the details as shown on the design plans prepared by the designer and those working plans prepared by Project Co. It shall be Project Co's sole responsibility to provide working plans of such a nature as to develop a finished product in accordance with design plans, Project specifications, and Project Agreement. Project Co shall verify pertinent dimensions in the field prior to conducting a working plans review. Participation

in the review of Project Co's design plans and working plans by the Region (or Stakeholders, if invited) shall not relieve Project Co of the responsibility for the satisfactory completion of the Work.

- (ii) Working plans shall be reviewed and approved in writing by the designer before beginning the construction Work and shall not thereafter be amended or altered without prior written approval of the designer and the Region, and where required by the respective City, public and private Third Party Utility, CN, Genesee and Wyoming formerly GEXR, GO, VIA, MTO, and agency having jurisdiction written consultation and comment.
 - (iii) All readiness for construction design, Final Design and Record Drawings shall be signed and stamped/sealed by the appropriate Responsible Engineer or Architect and shall include, on the title sheet for the plans, certification signatures of the Chief Engineer and the DQCM, (the title sheet shall be formatted to cite the appropriate certification requirements, Specifications, among other criteria).
- (f) Design and Record Drawing Format and Organization
- (i) Project Co shall organize and format design and Record Drawings per the attached Exhibit A and Project Co and Region mutually agreed approach to their format and organization.
- (g) CADD Standards
- (i) CADD formatting for design and Record Drawings shall conform to the attached Exhibit A and Project Co and Region mutually agreed approach.
 - (ii) CADD formatting for design and Record Drawings and Record Documents shall meet the requirements of the respective Stakeholder infrastructure ownership.
- (h) Project Specifications
- (i) Project Co shall prepare Project specifications in accordance with National Master Specification criteria and the Project Agreement.
 - (i) Project specifications shall be reviewed by Project Co and the Region during Design Reviews to verify that the Project specifications provide a level of quality that meets or exceeds the Project Agreement and with suitable and appropriate controls on the Work. Project Co shall be responsible for demonstrating the Project specifications meet or exceed the standard of quality established by the Project specifications in the Project Agreement, Schedule 11, Schedule 15, and Schedule 10 contained herein. The Region will determine, at its sole discretion, if the Project Co Project specifications meet the Project Agreement requirements.
 - (j) Project specifications shall define the type and frequency of all QC sampling and testing to be conducted for the Work covered by a Project specification. The more stringent requirements for sampling and testing shall be used at all times from industry accepted practice. At a minimum, OPS frequency of sampling and testing of materials and/or products shall be utilized. In circumstances where additional sampling and testing are deemed necessary; Project Co shall include these in its Design Unit Submittal and the

Project specification. The Region and Stakeholders may require additional sampling and testing at times during the progress of the Work. Project Co shall not be compensated for these additional requests.

Exhibit A Drawing Submission Requirements					
DISCIPLINE	CONTENTS	SCALE		HARD COPY	ELECTRONIC COPY
CIVIL	GENERAL DRAWINGS – G-GE-001-G-GE-005 G-GP-001-G-GP-005	FULL N.T.S.	SIZE: N.T.S.	TABLOID (11X17) AND ARCH D (24X36)	PDF AND CAD 2013 OR LOWER
CIVIL	EXISTING CONDITIONS- G-EC-001-G-EC-095 G-EC-100-G-EC-116 G-EC-201-G-EC-202 G-EC-901-G-EC-902 G-EC-301-G-EC-302	FULL 1:250	SIZE: N.T.S.	TABLOID (11X17) AND ARCH D (24X36)	PDF AND CAD 2013 OR LOWER
CIVIL	ALIGNMENT & OMSF DRAWINGS- C-ALG-001-C-ALG-012 C-PP-001-095 C-PP-100 – C-PP-116 C-PP-201-C-PP-202 C-PP-901-C-PP-902 C-PP-301-C-PP-302 C-PR-001-C-PR-045 G-CS-001-G-CS-018	FULL 1:250	SIZE: N.T.S.	TABLOID (11X17) AND ARCH D (24X36)	PDF AND CAD 2013 OR LOWER

Exhibit A Drawing Submission Requirements				
DISCIPLINE	CONTENTS	SCALE	HARD COPY	ELECTRONIC COPY
	C-DET-001-C-DET-005 C-U-001-C-U-095 C-U-100-C-U-116 C-U-201-C-U-202 C-U-901-C-U-902 C-U-301-C-U-302 C-PIW-001-C-PIW095 C-PIW-100-C-PIW116 C-PIW-201-C-PIW202 C-PIW-901-C-PIW-902 C-PIW-301-C-PIW-302 C-PIW-400-C-PIW-409	FULL SIZE: N.T.S. HALF SIZE: N.T.S. FULL SIZE: N.T.S. HALF SIZE: N.T.S.		
ARCHITECTURE	LRT STOP DRAWINGS-A.101-A.120 A.001-A.011	FULL SIZE: 1:200 HALF SIZE: N.T.S. FULL SIZE: AS NOTED HALF SIZE: N.T.S.	TABLOID (11X17) AND ARCH D (24X36)	PDF AND CAD 2013 OR LOWER

Exhibit A Drawing Submission Requirements					
DISCIPLINE	CONTENTS	SCALE		HARD COPY	ELECTRONIC COPY
ARCHITECTURE	ITS BLOCK DRAWINGS I-SA-001-I-SA-004	FULL N.T.S.	SIZE:	TABLOID (11X17)	PDF AND CAD 2013 OR LOWER
		HALF N.T.S.	SIZE:	AND ARCH D (24X36)	