

New York State Department of Environmental Conservation

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Joe Martens
Commissioner

May 10, 2013

Peter Sanderson, Project Director
The New NY Bridge Project
NYS Thruway Authority
303 South Broadway, Suite 413
Tarrytown, NY 10591

Re: The New NY Bridge
DEC Permit 3-9903-00043/00012
ENVIRONMENTAL COMPLIANCE PLAN (Revision 2 / May 7, 2013)

Dear Mr. Sanderson:

In accordance with condition 6 of the subject permit the Department hereby approves the subject Environmental Compliance Plan sent to me via a May 7, 2013 email from Kristine Edwards of your office. The plan was supplemented by a document titled Quality Plan / Uncontrolled Copy sent to me via a May 9, 2013 email from Ms. Edwards.

The Department's approval allows work identified in the permit's Authorized Activity to start, with the exception of those activities related to which a plan must still be approved.

These activities are pile driving, concrete production, dredging, decanting, armoring, and demolition. Plans to be submitted include the following:

- Underwater sound attenuation system for pile driving, per condition 9.
- Plans for concrete production, delivery and placement, per condition 18.
- Dredging plan, per condition 19.
- Barge decanting plan, if necessary, per condition 27.
- Plan for monitoring Piermont Marsh sedimentation rate, per condition 29.
- Armoring plan, per condition 36.
- Fish monitoring during dredging and pile driving, per condition 40.A.
- Procedures for surveying for stunned or dead fish during dredging and pile driving, per condition 41.
- Plan for in-water demolition.

These plans will be incorporated into and become a part of the Environmental Compliance Plan when approved by the Department.

As permit condition 76 states, the Department's approval makes the Environmental

Compliance Plan and its terms, conditions, schedule and other requirements an enforceable condition of the permit.

If you have any questions please feel free to contact me.

Respectfully,



John J. Ferguson

Chief Permit Administrator

ecc: K. Woodfield, NYSDEC
D. English, NYSDEC
W. Rudge, NYSDEC
K. Edwards, NYSDOT

Environmental Compliance Plan
for the
Tappan Zee Hudson River Crossing Project

Revision 2
May 7, 2013

Prepared by
Tappan Zee Constructors, LLC
555 White Plains Road
Tarrytown, NY 10591



Document History			
Issue Date	Description	By	Revision
03/08/13	Submitted for NYSTA review	JAG	0
03/28/13	Revised per NYSTA comments	JAG	1
05/07/13	Revised per NYSDEC comments	JAG	2

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1.0 Introduction

The Tappan Zee Constructors, LLC (TZC) has prepared this Environmental Compliance Plan (ECP) for the New York State Thruway Authority (NYSTA), to comply with the requirements of the Tappan Zee Hudson River Crossing Project (Project) Conformed November 2012 Contract Documents DB Part 3, Project Requirements Section 3 (DB Contract Documents Section 3) and the Environmental Performance Commitments (EPCs).

This ECP is consistent with applicable National Environmental Policy Act (NEPA) and New York State Environmental Quality Review Act (SEQR) commitments identified in the July 2012 Tappan Zee Hudson River Crossing Project Final Environmental Impact Statement (FEIS) and Section 4(f) Evaluation, September 2012 Record of Decision (ROD) and environmental and permitting commitments specified in the contract documents and draft permit conditions received to date.

The ECP includes the procedures to ensure compliance with EPCs of DB Contract Documents Section 3 Exhibit B, as well as compliance with other Environmental Requirements listed in DB Contract Documents Section 3, including:

- A. Environmental team overview: Environmental personnel names, titles, responsibilities, and environmental team organization.
- B. Environmental compliance tracking and reporting procedures:
 - 1. Process meetings and reporting requirements, including purpose and frequency of reports;
 - 2. Environmental compliance schedule;
 - 3. Method of reporting to the NYSTA of incidents and alleged exceedances of Environmental Requirements, Environmental Approvals and Environmental Laws; and
 - 4. QA/QC procedures for environmental compliance; and
- C. Environmental Approvals:
 - 1. Identify any environmental impacts that are greater than those disclosed in the EIS, and any additional impacts not identified in the Environmental Requirements, associated with Alternative Technical Concepts (ATCs – see Appendix A for complete list) adopted in the TZC Project Design and other technical concepts that are not ATCs;
 - 2. Identify all additional permits and Environmental Approvals, including supplements to the FEIS, required for implementation of ATCs included in the Project Design and other technical concepts; and
 - 3. Description of the plan to obtain all additional permits and Environmental Approvals identified and how they fit into the Project schedule.

This ECP also includes by reference other environmental plans required to meet the environmental obligations as required by the Contract Documents DB Contract Documents Section 3, EPCs (Exhibit B), and federal state and local permit conditions 4.4.

The ECP is a living document and will be revised to address amendments or changes to permit conditions that are made throughout the project. Periodic reviews of the plan and procedures will be undertaken to ensure continual improvement of the plan's adequacy. Because the Project involves a design/build contract, the ECP is intended to be flexible and tailored to match highly variable construction

activities. The ECP provides a general framework for methods that will be employed to reduce environmental impacts from construction activities. Specific environmental requirements and controls will be tailored to the various construction sites/activities and will be references as appropriate in design documents.

1.1 NEPA/SEQRA Compliance

Final design and construction of the Project Design must be coordinated with the environmental review required by the NEPA and SEQR. To meet NEPA and SEQR requirements, the FEIS presented two project alternatives that provide an envelope of potential design options and their associated environmental impacts. A Record of Decision (ROD) summarizing the impacts and mitigation requirements was issued by the Federal Highway Administration (FHWA) for the project in September 2012. The FEIS and ROD are publicly available on the project website: <http://www.newnybridge.com/documents/feis/>. Changes in the Project Design and anticipated construction means and methods will be re-evaluated in consultation with the FHWA, and in accordance with 6 NYCRR Part 617, 17 NYCRR Part 15, 23 CFR 771.129 and 23 CFR Part 771.130, as necessary, to ensure compliance with NEPA. NEPA re-evaluation documents will be also be completed in coordination with FHWA prior to the decision to incorporate the work into the Project. The NEPA review and revision process is described further in Section 4.2.

1.1.1 NEPA Re-evaluations

A NEPA Re-evaluation Statement (December 2012) was prepared to assess the potential environmental impacts of the Project Design to the conclusions of the FEIS. The Re-evaluation, prepared in accordance with 23 CFR 771.129, 6 NYCRR Part 617 and 17 NYCRR Part 15, determined that the conclusions of the FEIS and ROD remain valid and a Supplemental EIS (SEIS) or other additional environmental analysis is not needed. Additionally, the conditions of 23 CFR 771.130(a) have not been met; therefore, further evaluation of these changes through an SEIS or any additional environmental analysis is not necessary.

1.2 Permitting and Environmental Compliance

- The following environmental permitting applications have been submitted and/or permits have been issued to date for the Project: U.S. Coast Guard (USCG) Bridge Permit: original application filed with USCG March 26, 2013; Draft Clean Air Act (CAA) Conformity Determination issued on August 4, 2012; supplemental application submitted to USCG January 3, 2013; Final CAA Conformity Determination issued February 28, 2013
- U.S. Army Corps of Engineers (USACE) Nationwide Permit 6 (NWP 6): concurrence request filed with USACE January 8, 2013; NWP 6 concurrence received February 7, 2013
- USACE Section 10/Section 404 Permit: original application filed with USACE March 26, 2012; supplemental application filed with USACE January 11, 2013
- USACE Section 103 Permit for disposal at the Historic Area Remediation Site (HARS): original application filed with USACE March 26, 2012; application withdrawal letter for Stage 1 dredge disposal activities submitted to USACE March 8, 2013
- New York State Department of Environmental Conservation (NYSDEC) Tidal Wetlands, Article 11 Incidental Take, Section 401 Water Quality Certification Permit: original application filed with NYSDEC March 27, 2012; Draft NYSDEC Permit conditions issued June 2012; supplemental application submitted January 4, 2013; NYSDEC draft Permit conditions issued January 23, 2013; NYSDEC Permit approval received March 25, 2013.

- New York State Department of State (NYSDOS) Coastal Zone Management (CZM) Consistency Determination: original application filed with NYSDOS March 26, 2012; supplemental application submitted January 11, 2013; NYSDOS CZM Consistency Determination received February 7, 2013;
- New York State Department Office of General Services (NYSOGS) Use of Lands Underwater Conveyance: original application filed with NYSOGS March 26, 2012; supplemental application submitted January 4, 2013; NYSOGS Use of Lands Underwater Conveyance received March 2013;
- Federal Highway Administration (FHWA), Advisory Council on Historic Preservation (ACHP) Section 106 Consultation: FHWA, ACHP, New York State Historic Preservation Office (NYSHPO), NYSTA and NYSDOT Section 106 Memorandum of Agreement (MOA): signed MOA signed June 22, 2012; FHWA Letter of No Effects January 2013; NYSHPO Section 106 concurrence letter November 20, 2012.
- National Marine Fisheries Service (NMFS) Section 7 Consultation: Original NMFS Biological Opinion and Essential Fish Habitat Assessment issued June 22, 2012;

As design changes are proposed and/or Project there permits and/or permit modifications will be pursued as necessary and coordinated through the NYSTA Project. The permit review and revision process is described further in Section 4.2.

2.0 Project Description

The federal lead agency, Federal Highway Administration (FHWA) and the NYSTA are sponsoring the Project, which includes the construction of a new bridge crossing, consisting of two parallel bridge structures over the Hudson River between Rockland and Westchester Counties. The project site is located on the Hudson River (River Mile 27) between the Village of Tarrytown, Westchester County, NY and the Village of South Nyack, Rockland County, NY (see Figure 1, Project Location Map).

The ECP has been prepared to address all of the proposed construction and demolition components of the Project, including the following:

- Two approach spans and a NYSTA Maintenance Platform that would meet landings in Rockland County, and two approach spans meeting landings in Westchester County;
- Two cabled-stayed main spans over the federal navigation channel;
- Waterfront staging areas at the approach span landings and inland construction staging areas;
- Temporary work trestles adjacent to the approach spans near both the Rockland and Westchester shorelines;
- Temporary and permanent relocations of NYSTA facilities and New York State Troopers Barracks within NYSTA right-of-way (ROW);
- Demolition of the existing Tappan Zee Bridge;
- Dredging operations adjacent to the approach spans to accommodate construction activities; and
- Potential dredged sediment disposal sites including the Historic Area Remediation Site (HARS) in the Atlantic Ocean and potential upland sites.

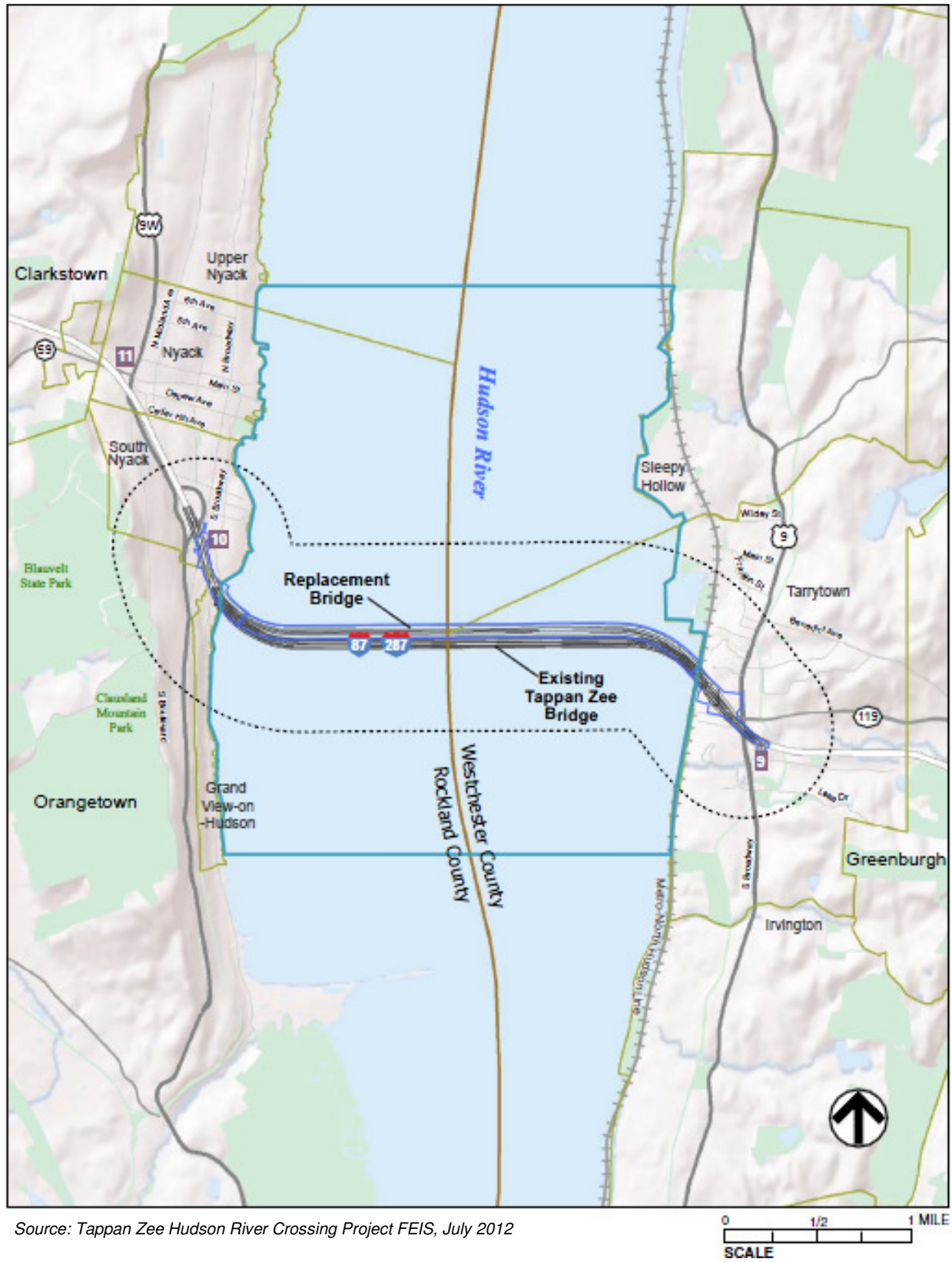


Figure 1 – Project Location

3.0 Environmental Compliance Team Organization

3.1 NYSTA Environmental Compliance Leads

The NYSTA has retained HNTB Corporation and a team of subconsultants as the Owner's Engineer to provide independent oversight under 23 CFR 637 for all project activities. A significant aspect of the Owner's Engineer responsibilities is to provide the independent Oversight Environmental Monitor (OECM) to fulfill the requirements of NYSDEC Permit Condition 4 (DEC 4), Oversight Environmental Compliance Monitor (OECM). The independent OECM will lead a team of independent environmental professionals to provide the services required to fulfill DEC 4, specifically:

- A. Be present on-site during all Authorized Activity;
- B. Observing and inspecting the Authorized Activity;
- C. Reporting to the Department on a weekly basis regarding compliance with the Permit; and
- D. Reporting noncompliance with the Permit immediately but not less than 12 hours after observation.

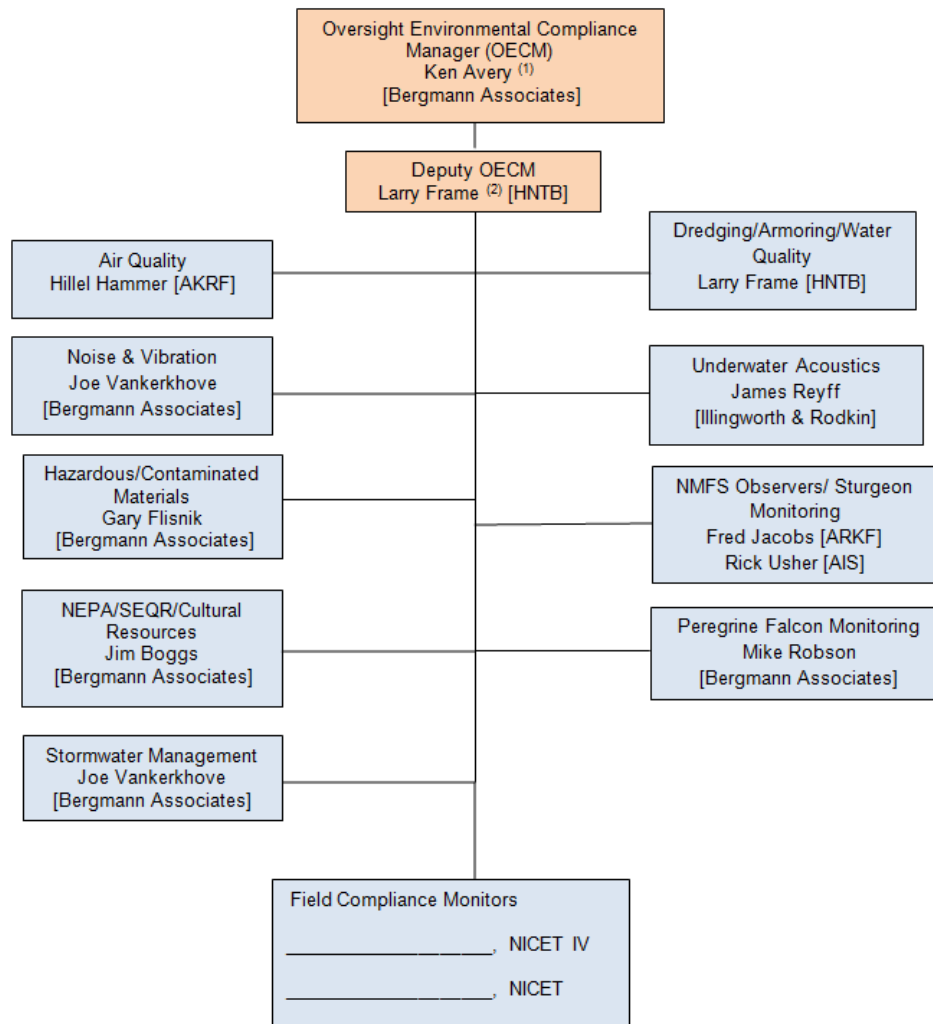
The Owner's Engineer Environmental Compliance Team outlined in Figure 2 below mirrors the Design-Builder's Environmental Compliance Team (Figure 3) so that compliance can be more easily coordinated. The Owner's Engineer will also be addressing the Net Conservation Benefits and Compensatory Mitigation required under the permit, and other environmental and cultural resources. For clarity, the following organization chart is meant to specifically address DEC 4.

For each activity authorized under the NYSDEC Permit that requires monitoring for which an Environmental Plan is developed by TZC, LLC, the independent OECM will also prepare a separate oversight environmental plan that will outline the oversight activities and reporting procedures. Specifically, this will apply to the following plans and NYSDEC Permit conditions:

- Ecological Management Plan
 - Water Quality Plan (DEC 59)
 - Dredging and Pile Driving Plan (DEC 41)
 - Underwater Noise Monitoring Plan (DEC 9)
 - Sturgeon Monitoring Plan (DEC 40, 44)
- Peregrine Falcon Plan (DEC 55)
- In-Water Demolition Plans (DEC 45)
- Dredge Materials Management Plan (DEC 19, 23, 27)
- Concrete Production Delivery /Placement Plan (DEC 18)

These plans will be submitted to NYSDEC within 10 business days of the final approval of the associated TZC, LLC Environmental Plans.

Figure 2: Owner's Engineer Environmental Compliance Team



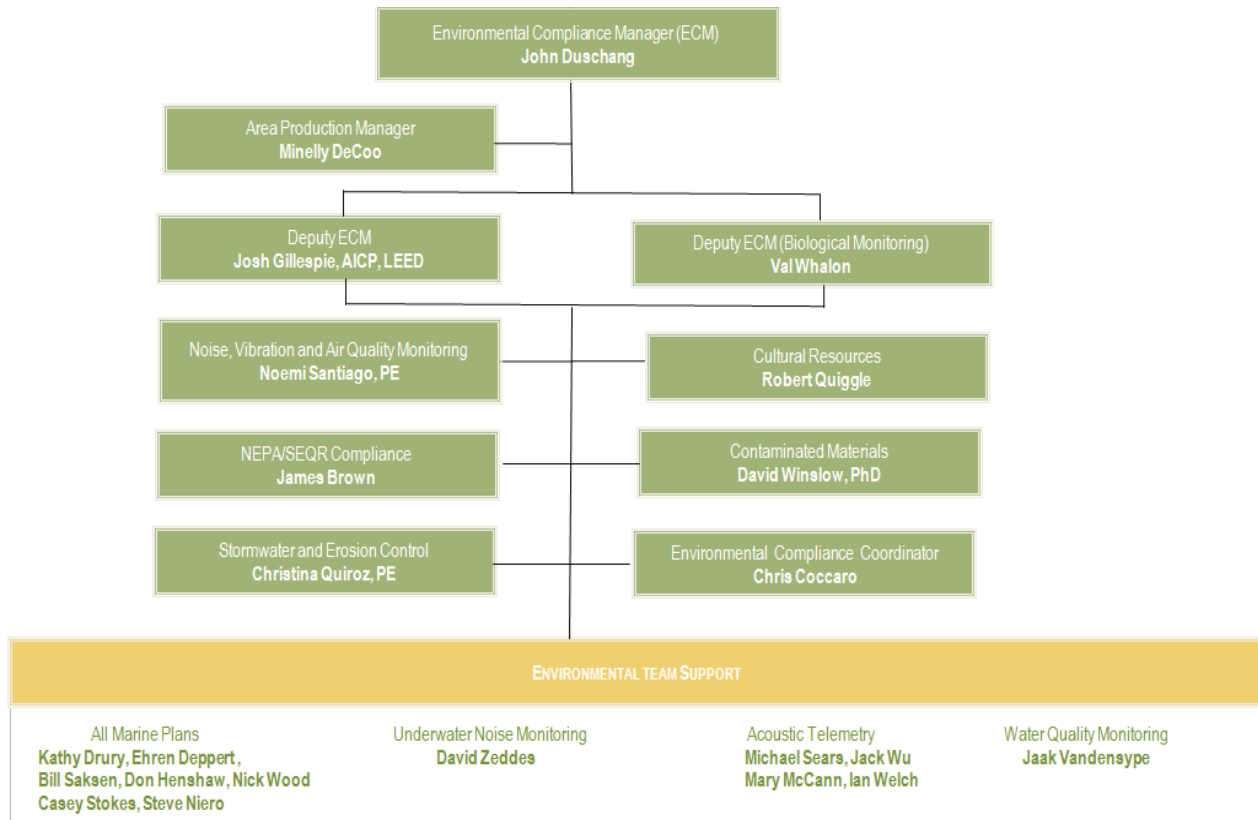
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3.2 Environmental Compliance Team

The TZC, LLC has assembled an Environmental Compliance Team (ECT) with specific, regulatory and local knowledge, and appropriate experience to achieve environmental compliance during design and construction in accordance with the environmental contract documents, as well as with applicable federal, state, and local permits and approvals. Key members of the ECT for design and construction phases and their responsibilities are presented below (Figure 2). Resumes of the key staff members highlighting their expertise, experience, licenses/certifications and training are provided in Appendix B to this plan.

Figure 3: Environmental Compliance Team Organization Chart



The ECT is led by the Environmental Compliance Manager (ECM). The ECM will serve as the primary contact for the NYSTA's Compliance Manager, the OEM, the Construction Manager, and federal, state and local regulatory agencies. The ECM, supported by the ECM Deputies, will oversee the activities related to environmental compliance and commitments and have the following responsibilities:

- Manage environmental compliance activities during design and construction phases (permit application, construction, and monitoring) for the Project, including interfacing with regulatory agencies;
- Review, comment and approve environmental studies, reports, plans, designs, contract documents, and permit applications;
- Review and approve the incorporation of permit conditions and mitigation requirements into the Project design, contract documents, and cost estimates; and
- Review and audit construction work to ensure environmental compliance with the contract and all regulatory requirements.

The ECM and Deputy ECMs will coordinate with the individual technical leaders to identify, prepare and obtain environmental permits and approvals in advance of construction activities. The ECT Area Production Manager facilitates document control and coordination between the Design Discipline Leads and the ECT staff, and that the environmental permits/approvals will occur on schedule in advance of scheduled construction activities.

On the construction site(s), TZC Project Engineers and Superintendents will be responsible for construction activities on-site and will receive Environmental Training (described in Section 4.2). Project

Engineers and Superintendents will be responsible for coordinating with the Environmental Compliance staff on-site and contacting the ECM as environmental-related concerns and compliance issues arise.

The ECT staff will continually review Project conformance with NEPA, SEQR, applicable regulatory programs/ permits and will apply regulatory and local knowledge so that the construction activities meet these requirements (see Section 4.3 for additional detail).

4.0 Environmental Compliance Tracking and Reporting

The ECT will implement a communication protocol with the NYSTA to maintain a clear picture of the Project's environmental commitments and promote effective, timely coordination, information distribution, and decision-making to acquire permits in advance of construction. The ECM will be the primary environmental point of contact between the NYSTA and TZC, LLC in an effort to maintain a consistent and clear line of communication. The NYSTA's Compliance Manager and OEM will facilitate communication and coordination with the NYSTA. Depending on the issue or request, the ECM will involve the appropriate members of the ECT and/or other to prepare an efficient, regulatory compliant response or recommendation.

Coordination with the NYSTA involves reviews and discussions of the compliance status of the Project with environmental requirements, including reviews of:

- a 90-day look ahead permit tracking matrix,
- a project-wide permit tracking matrix,
- subject-based circulation lists/briefings/logs,
- contract deliverables and
- appropriate environmental compliance reports during construction.

Project information will be provided to regulatory agencies, and in some instances, project information will be provided to project stakeholders and the public through the TZC's Public Involvement Program.

The ECT will compile and disseminate the environmental contract requirements (including EPCs), environmental documentation (e.g. FEIS, ROD, SEQR determination), permit terms and conditions so that TZC staff can incorporate these requirements into the design and construction activities. The EPCs summary table is provided for reference in Appendix C, EPC Summary Table.

A comprehensive list of environmental permits and approvals for the project will be maintained and tracked in an Environmental Permits Matrix, including: permit/approvals, responsible party, scheduled submittal dates, anticipated approval dates and current status. The Environmental Permits Matrix will be supported by a database using an interactive log to identify and track the permit status. The list of environmental permits/approvals necessary for the current activities and permit status is provided in the Environmental Permits Matrix for the Project. An example of the key elements of the permit application process that will be tracked for each permit is provided below.

Example of Environmental Permits Matrix

Ref. No.	Work Site/Activity	Sub-Activity	Permit/Approval	Lead	Assist	Activity Start	Draft Application Due	Application Submittal Date	Draft Permit Conditions Due Date	Permit Approval Due Date	Status

During the construction phase of the Project, the ECT will use an Environmental Compliance Matrix supported by a database to track key aspects of regulatory permit compliance and contractual environmental compliance. The database will use an interactive log to identify and track the compliance-related items for each permit. The regulatory compliance tasks will be performed with the overall objective of minimizing potential delays and possible violations. An example of the key data points that will be tracked for each permit is provided below.

Example of Permit Compliance Matrix

Ref. No.	Work Site/Activity	Permit/Compliance Plan	Compliance Activity	Observation Date	Compliance (Y/N)	Non-Compliance Notes	Notification	Compliance Correction Due Date	Corrective Actions	Inspector

The tracking database will generate monthly environmental permit schedule reports and environmental compliance reports that will be reviewed and approved each month by the ECM. Exceedances of permit conditions, EPCs, or other required compliance criteria and other environmental incidents will be reported to the ECM immediately and resolved with the Supervisor on-site and appropriate Project Manager, as soon as possible. Exceedances, incidents and resolutions will be tracked in the Permit Compliance Matrix, also. Specific environmental exceedances will be reported and resolved in the according to the applicable Environmental Plan and reported to the OEM. In the event of a permit exceedance, regulatory agencies will be contacted by the OEM, as specified in the permit conditions. Using this process, the OEM and the ECT will be able to successfully confirm environmental compliance and communicate the project's compliance to the regulatory agencies and the public.

4.1 Process Meetings, Reporting Requirements, Training

To effectively advance and coordinate the environmental approvals, the ECT will meet with OEM and NYSTA representatives on a weekly basis from NTP through 120 days of NTP. Once the ECP and its component Environmental Plans and project communication and reporting protocols are in place and construction begins, monthly meetings will occur with the NYSTA to review:

- On-going project activities
- Permit tracking database
- EPC compliance
- Upcoming environmental compliance activities
- Required reports to regulatory agencies
- Public involvement activities

Following 120 days after NTP and for the first year of the Project, bi-monthly meetings with the NYSTA, OEM and NYSDEC will be held to track environmental compliance with the NYSDEC Permit.

4.2 Environmental Training

The ECT will provide task-specific environmental compliance training for Project Engineers and Superintendents responsible for construction activities. ECT staff will be required to take Occupational Safety & Health Administration (OSHA) 10-hour training course. Personnel involved with contaminated materials will be required to have OSHA 40-hour Hazwoper training, at a minimum, in addition to training and licenses/certifications identified in the Contaminated Materials Management Plan (CMMP). Training will be scheduled in advance of activities so that personnel are trained and well informed prior to the start of construction. As needed, additional training sessions will be conducted throughout the construction process for new Project Engineers and Superintendents, as relevant new information is presented, or for new construction activities.

Topics to be covered during the environmental compliance training sessions will include, but not be limited to the following:

- Accident and emergency communication procedures
- Environmental mitigation measures
- Public complaint procedures according to the Public Involvement Plan Support Plan
- Public Outreach Team coordination
- EPCs and methods to implement these commitments properly
- Protocols for complying with these requirements during different stages of construction
- Environmental schedule constraints
- Protocols for reporting emergencies or alleged environmental exceedances
- Identification of threatened, endangered species, and species of special concern identified in the Project area and their potential locations and methods for reporting sightings
- Proper reporting, storage, inspection, and handling requirements for hazardous waste
- Task-specific permit conditions
- Cultural resource protection procedures
- Spill Prevention, Control, and Countermeasures Plan procedures
- Stormwater Pollution Prevention Plan and Soil Erosion and Control Plan procedures

Training sessions will be coordinated between the ECM, the Construction Manager and the NYSTA. The Construction Safety Manager will also identify staff requiring safety training and will maintain records for all personnel who receive training.

4.3 Design/Construction Change Review Process

The ECT will coordinate closely, with the Discipline Leads and Project Managers to identify any design change, any new information that could result in environmental impacts not previously identified that could:

- (1) Result in environmental impacts greater those assessed in the FEIS or new impacts not included in the FEIS that would require a new NEPA Re-evaluation; and/or
- (2) Require additional permits/environmental approvals or permit modifications.

Upon identifying a design change that may require additional NEPA review and/or permitting, the ECT will first coordinate with the Design Discipline Lead and Project Managers to make all efforts to avoid, minimize and/or mitigate the new environmental impacts. If, after further coordination, the additional NEPA review and/or permitting cannot be avoided, the ECT will notify the NYSTA's Compliance Manager and OECM. An environmental review/re-evaluation will be prepared in consultation with NYSTA and FHWA, as necessary. Following completion of the environmental review/re-evaluation, any new permit applications or permit modifications required to accommodate the design change will be prepared in consultation with NYSTA. Consistent with the requirements of DB Contract Section 104-4.4, if the design change will require a new permit, TZC, led by the ECM, will be responsible for obtaining the permit approval or modification in advance of starting any corresponding construction activity.

4.4 Environmental Compliance Schedule and Construction

As indicated in the Project's schedule, the anticipated project construction is approximately 5 years. To accomplish construction completion within the project schedule, construction activities are scheduled to begin May 9, 2013. Initiation of construction activities will require that Environmental Approvals have been completed, including:

- Procurement of applicable permits necessary for construction activities

- Completion of the DB Contract Section 3.4. Deliverables, which states that deliverables need to be provided to the Authority by the earlier of: (i) 120 days after NTP (May 18, 2013) and (ii) 30 days prior to the relevant construction activity.

4.5 Environmental Plans

This ECP has been prepared based on the DB Contract Documents Section 3, which identifies specific project environmental approvals and contract-required environmental compliance plans necessary to be in place to allow the construction activities of the Project to proceed. Relevant environmental plans are due at least 30 days prior to the specific construction activity or within 120 days after NTP. As required by the DB Contract Documents Section 3, EPCs (Exhibit B) and Draft NYSDEC Permit conditions, the following Environmental Plans have been prepared to address construction and demolition activities of the Project:

- (1) Spill prevention, control, and countermeasures plan
- (2) Contaminated materials management plan
- (3) Hazardous waste operations safety & health program
- (4) Construction noise and vibration control plan
- (5) Air quality control plan
- (6) Dust control plan
- (7) Environmental health and safety plan
- (8) Rodent control plan
- (9) Lead compliance plan
- (10) Project-generated waste management plan
- (11) Cultural Resource Protection Plan, encompassing the following:
 - a. Construction protection plan for historic properties
 - b. Educational and interpretive materials plan
 - c. Unanticipated discoveries plan
- (12) Dredge materials management plan
- (13) Ecological Management Plan, encompassing the following:
 - a. Dredging and Pile Driving Monitoring Plan:
 - b. Sturgeon Acoustic Telemetry Monitoring Plan.
 - c. Underwater Noise Monitoring Plan.
 - d. Water Quality Monitoring Plan.
- (14) Energy conservation and renewable energy plan
- (15) Remedial Action Plan (RAP) & Construction Health and Safety Plan (CHASP)

Each of these plans have undergone review of the Project construction and demolition activities to include anticipated impacts covered by the subject area of plan and general activities to be undertaken within the plan to achieve and ensure environmental compliance. Each plan will describe the relevant details of the construction activities and the environmental controls to be in place during those activities to meet environmental commitments outlined in EPCs, applicable laws, regulations and permit conditions. Each Environmental Plan will be submitted to the NYSTA for review and comment within the framework of the schedule described above.

Brief highlights of the Environmental Plans are provided below; however, please refer to the Plans individually for further detail.

Spill Prevention, Control, and Countermeasures Plan (SPCC Plan)

An SPCC Plan has been developed to address the requirements of the federal Oil Pollution Prevention Regulations, commonly referred to as the SPCC Rule. This SPCC Plan establishes oil spill preparedness, prevention, planning, response, and notification procedures as set forth in these regulations. This SPCC plan also addresses state-specific oil spill reporting notification and response requirements.

Contaminated Materials Management Plan

Contaminated Materials Management Plan (CMMP) will present methods to be employed to handle, mitigate, transport, and dispose of contaminated materials encountered as part of the construction project including contaminated soils, contaminated groundwater, asbestos-containing materials, and PCB-bearing materials. The CMMP will include a description of the potential contaminated materials expected to be encountered during the project, a quality management plan, a sampling and analysis plan to evaluate whether the materials are contaminated, a field sampling plan presenting field sample collection methods, a review of appropriate regulatory standards, sample handling requirements, data quality objectives, data reduction, validation and reporting requirements, proposed disposal facility descriptions and permits, stockpiling procedures, and transportation requirements.

The CMMP will present a detailed approach to characterize soils for disposal purposes and/or for reuse within the project limits. Soil wastes will be managed in accordance with local, state and federal regulations.

Hazardous Waste Operations Safety and Health Program

The Hazardous Waste Operation Safety and Health Plan has been prepared identify federal and state safety and health requirements necessary to be in place in the event that hazardous waste is encountered.

Construction Noise and Vibration Control Plan

A Construction Noise and Vibration Control Plan has been developed to address specific construction activities, and will identify the means and methods that will be used to abate noise and vibration impacts during construction in accordance with the Project construction noise and vibration environmental performance commitments (EPCs).

Air Quality Control Plan

The Air Quality Control Plan has been developed to address specific construction activities, and will identify the means and methods that will be used to minimize and avoid air emissions during construction in accordance with the Project construction air quality EPCs.

Dust Control Plan

A Dust Control Plan has been developed to address specific construction activities, and will identify the means and methods that will be used to abate potential dust impacts during construction.

Environmental Health and Safety Plan

An Environmental Health and Safety Plan has been developed to provide occupational health and safety guidelines for ECT staff performing activities on the Project site. The Plan is committed to the prevention of personal injuries, damage to equipment and property, the protection of the general public and protection of the environment.

Rodent Control Plan

A Rodent Control Plan has been developed to address specific construction activities, and will identify the means and methods that will be used to control rodents during construction.

Lead Compliance Plan

A Lead Compliance Plan has been developed to address specific construction activities, and will identify the means and methods that will be used to abate lead-based paint impacts during construction and demolition.

Project-generated Waste Management Plan

A Project-generated Waste Management Plan has been developed to provide procedures and processes to reduce, recycle and/or properly dispose of Project-generated construction waste materials and other wastes during construction activities.

Cultural Resource Protection Plan

To mitigate effects to historic/archaeological and cultural resources, a Cultural Resource Protection Plan will be developed in consultation with the New York State Office of Parks, Recreation and Historic Preservation (NYSHPO) and other applicable parties. The plan will outline a programmatic approach to determining the appropriate measures to minimize or mitigate adverse project effects. Mitigation methods will include the Historic American Engineering Record (HAER) recordation of the existing Tappan Zee Bridge by qualified staff as prescribed in the EPCs and Project MOA.

The plan will also address procedures for the unanticipated discovery of archaeological resources, human remains and/or cultural resources that may be encountered over the duration of the project per NYSHPO, NYSDOT and NYSTA requirements. At a minimum, the procedures defined in the plan will include contacting the ECM; coordination with the OEM, NYSTA and NYSDOT; the immediate cessation of ground disturbance or underwater activities in the vicinity of the discovery site; installation of temporary barriers or buoys identifying the location and restricted access to the site by unauthorized persons; and additional consultation with the NYSHPO and other agencies, as applicable, to determine the appropriate measures for treatment.

Dredge Materials Management Plan

A Dredge Materials Management Plan has been developed to provide the means and methods to be used to during dredging and armoring activities within the Hudson River.

Ecological Management and Monitoring Plan

The Ecological Management and Monitoring Plan will focus on project activities that could potentially impact sensitive ecological resources. For identified impacts on oyster reefs, essential fish habitat, and threatened or endangered species, detailed management and monitoring plans will be developed to minimize or compensate for the loss of or adverse impacts to these resources according to EPCs and DB Contract Documents Section 3 requirements. The Ecological Management and Monitoring Plan primarily covers in-water construction activities, and includes the following component plans:

- (1) Dredging and Pile Driving Monitoring Plan. This plan is prepared according to the Pile Driving, Dredging, and Fish Monitoring During Construction conditions of the NYSDEC Permit, the National Marine Fisheries Service (NMFS) Biological Opinion (BO), and Contract Documents.
- (2) Sturgeon Acoustic Telemetry Monitoring Plan. This plan is prepared according to the Fish Monitoring During Construction conditions of the NYSDEC Permit, NMFS BO, and Contract Documents
- (3) Underwater Noise Monitoring Plan. Prepared to address monitoring underwater noise levels for the protection of sturgeon according to the Pile Driving NYSDEC Permit conditions, NMFS BO, and Contract Documents.

- (4) Water Quality Monitoring Plan. Prepared according to Water Quality conditions of the NYSDEC Permit conditions, NMFS BO, and Contract Documents.

Energy Conservation and Renewable Energy Plan

An Energy Conservation and Renewable Energy Plan has been developed to provide guidelines to reduce energy consumption by incorporating energy efficient design and minimizing unnecessary waste of construction materials in accordance with the FEIS and Contract Documents.

Remedial Action Plan (RAP) & Construction Health and Safety Plan (CHASP)

A RAP has been prepared to outline appropriate remedial actions to address known and potential environmental conditions encountered during construction in accordance with state and federal remediation regulations. Appended to the RAP is the CHASP, which establishes the procedures necessary for protection from potential contaminated/hazardous materials that may be encountered during implementation of the remedial activities outlined in the RAP.

Peregrine Falcon Protection Plan

As required by the DB Contract Section 3, Exhibit B Item 8 and the NYSDEC Permit, a Peregrine Falcon Protection Plan will be prepared to protect an existing peregrine falcon nest on the existing Tappan Zee Bridge. This plan describes the implementation of protocols developed by NYSTA, NYSDEC and NYCDEP for minimizing disturbance to bridge-nesting peregrine falcons during construction and demolition for the Project to the greatest extent possible during the February through August nesting period.

Temporary and Permanent Docks Plans

As required by the DB Contract Section 3, Exhibit B Item 11 and the NYSDEC Permit, submit plans of the temporary and permanent docks, bulkheads and other in-water structures and facilities, and pile driving activities to NYSTA and NYSDEC no less than 30 days prior to construction. The construction methods installing the temporary and permanent docks will adhere to the protocols listed in Exhibit B Item 8, USACE Section 10/404 Permit, US Coast Guard Bridge Permit and the NYSDEC Permit.

In-Water Concrete Placement Plans

Plans and descriptions of the means of concrete production, delivery and placement will be submitted to NYSTA 60 days before concrete is to be used, according to DB Contract Section 3, Exhibit B Item 12. These In-Water Concrete Placement Plans will also be submitted to the NYSDEC no less than 30 days according to the NYSDEC Permit. These plans are prepared to prevent the discharge of cement into the Hudson River and maintain acceptable water quality levels.

Maintenance and Protection of Traffic Plan

A Maintenance and Protection of Traffic Plan (MPT) will be submitted to the NYSTA 60 days prior to start of construction activities affecting roadways according to DB Contract Section 5 and Section 3, Exhibit B Item 13. Traffic control measures to ensure the safe and efficient movement of traffic around work zones, including access for emergency services (fire, medical, police), businesses and residences. The MPT will also incorporate local agency requirements regarding the hauling of any construction materials on acceptable routes, roadways, and times. In addition, the transport and disposal of dredge spoils will be specified in the MPT Plan according to DB Contract Section Exhibit 4(D), including transport by barge/scow, either to the Historic Area Remediation Site (HARS) in the New York Harbor or elsewhere, or by truck or rail to upland disposal sites of dredge material.

Community Character

In an effort to protect and accommodate local community life during construction of the Project, the TZC LLC will actively maintain a clean and orderly work site according to DB Contract Section 3 Exhibit B Item 14. The ECT will actively monitor the (DB Contract, permit and applicable regulatory) required environmental compliance of construction activities and will track such compliance will be tracked in the Environmental Compliance Matrix described earlier. Resolution and enforcement of any alleged environmental exceedances or incidents will be addressed as described below under 4.5.

Public complaints will be forwarded to the Public Outreach Team and addressed according the Public Involvement Support Plan. TZC, LLC in coordination with the NYSTA will be undertaking a very proactive community outreach program to inform the public of upcoming construction activities and serving to address public concerns in advance.

Environmental Approvals and Permits

A comprehensive effort has been undertaken by the ECT to identify all applicable Environmental Approvals and permits for the Project. As stated previously, the applicable permits and environmental approvals will be obtained prior to start of the task-specific construction or demolition activity. Permit conditions of the listed permits and approvals will be incorporated into the Environmental Compliance Matrix and tracked for compliance throughout the construction of the Project.

4.6 Reporting Alleged Exceedances and Incidents

Environmental Plans will identify the applicable construction activities and monitoring procedures to inspect for compliance including the specific items or locations to be inspected, the inspection to be employed (i.e. visual, auditory, testing by instrument), and acceptability criteria to be applied by the ECT staff. An inspection report covering the activities reviewed will be completed by ECT staff.

Exceedances of environmental permit or compliance criteria, or other environmental incidents, will be reported to the ECM immediately and resolved with the Construction Supervisor on-site and/or appropriate Project Manager, as soon as possible. The ECM will notify the OECM of exceedances or noncompliances. In accordance with the NYSDEC Permit, the OECM will notify the NYSDEC of all non-compliance with the NYSDEC Permit and NYS Environmental Conservation Law within 12 hours.

In the event that a spill, emergency response, or alleged permit condition exceedance occurs at the Project site, an Incident Data Sheet and Incident Report (IR) will be completed by the ECM or designee as well as Safety Manager, if appropriate, with a copy provided to the OECM, Construction Manager and the NYSTA. Regulatory agencies will be contacted as requested by permit conditions and applicable laws and regulations.

An Incident Root Cause Analysis Form will be prepared following the completion of the Incident Report. Based on the information presented on this form, corrective actions will be identified to prevent the incident from recurring. ECT staff will record corrective actions undertaken or to be performed to prevent the incident from reoccurring or to indicate any maintenance required on the item inspected. Copies of IRs with identified corrective actions will be provided to the OECM, NYSTA, Construction Manager, and Safety Manager.

Exceedances, incidents and resolutions will be tracked in the Permit Compliance Matrix, as mentioned earlier. Specific environmental exceedances will be reported and resolved in the according to the protocols of the applicable Environmental Plan.

4.7 QA/QC Procedures for Environmental Compliance

The ECT will be responsible for Environmental Quality Control (QC) and Quality Assurance (QA) while the NYSTA's Compliance Manager and OEMCM undertake the role of oversight. Environmental QA/QC will be included in our overall Quality Assurance Plan for the construction of the Project. QC procedures outlined in the project's Quality Plan will be followed to document environmental compliance. A compliance audit will be conducted by responsible staff as identified in the Quality Assurance Plan. The audit will check that the proper environmental compliance inspections are occurring and reporting requirements are fulfilled and have undergone QC.

4.8 Regulatory Contact List

The NYSTA, OEMCM and ECM will be responsible for contacting and coordinating with appropriate regulatory agencies. The following is the current regulatory agency contact list for the Project:

Agency	Contact Person	Phone	Address
USACE Section 10, 404 and 103 Permits; Nationwide Permits	Chris Mallery Steven Schumach	917-790-8418 917-790-8417	Eastern Section Regulatory Branch NY District U.S. Army Corps of Engineers 26 Federal Plaza, Room 1937 New York, NY 10278
USACE Commercial Mooring Buoy Permits	Steve Ryba	917-790-8512	Chief, Eastern Section Regulatory Branch NY District U.S. Army Corps of Engineers 26 Federal Plaza, Room 1937 New York, NY 10278
USCG Notice to Mariners/Waterways Operations	Jeff Yunker,	718.354.4195	USCG Sector NY 212 Coast Guard Dr, Staten Island, NY 10305
USCG Bridge Permit	Chris Bisignano	212-668-7994	
USCG In-water Spill Hotline		800-424-8802	
NYSPOH	John A. Bonafide	(518) 237-8643 ext. 3263	New York State Division for Historic Preservation New York State Office of Parks, Recreation & Historic Preservation Peebles Island State Park P.O. Box 189 Waterford, NY 12188-0189
NYSDEC Region 3	Larry Wilson	(845) 256-3070	21 South Putt Corners Road, New Paltz, NY 12561-1696 lwilson@gw.dec.state.ny.us
NYSDEC Region 3,	Bill Rudge	(845) 256-3092	21 South Putt Corners Road, New Paltz, NY 12561-1696 wprudge@gw.dec.state.ny.us
NYS DEC Spill Hotline		(800) 457-7362 or (518)-457-7362	
EPA Region 2 Spill Hotline* (SPCC Plan* has full list of spill response contacts)		(212) 637-4040	

Appendix A:

Alternative Technical Concepts (ATCs)

ENVIRONMENTAL COMPLIANCE PLAN

Value Engineering – Alternative Technical Concepts (ATCs)

ATC Name	Description	Response
ATC-#02 - Profile Modification - Symmetrical 1.49% Main Span Approach Profile Grades	Vertical profile of the Rockland approach would be begin at -0.77% and transition to +1.49% until the midpoint of the main span. The Westchester approach would begin at a grade of -0.30% percent at the abutment and transition to a +1.49% creating a symmetrical vertical grade about the midpoint of the main span.	<i>Approved</i>
ATC-#4 - Grade 75 Galvanized Reinforcing Bars	Use of ASTM A 615 Grade 75 galvanized (ASTM A 767 Class I coating) reinforcing bars in addition to the reinforcing bars specified in the RFP anywhere on the project.	<i>Approved</i>
ATC-#06 Rockland Median Widening	Widen the I-287/I-87 median at the Rockland landing an additional 2 feet from what is shown in the Indicative Plans in order to accommodate Future Potential Loading. The Proposer also would like to consolidate the eastbound and westbound maintenance ramps into one central maintenance ramp within the median.	<i>Conditionally Approved</i>
ATC-#10 Elimination of Permanent Intermediate Diaphragm	Eliminate the installation of permanent intermediate diaphragms between adjacent precast concrete girders.	<i>Not an ATC, can be used in Proposal</i>
ATC-#11 Toll Plaza Approach Taper	Reduce the toll plaza taper length from 970 feet to 464 feet creating a 1:8 toll plaza taper.	<i>Conditionally Approved</i>
ATC-#12 Toll Plaza Lane Configuration	Provide seven mixed-mode lanes and two ORT lanes for toll plaza operations during the early phases of the project construction. This scheme would also be implemented during the construction of the new toll plaza.	<i>Conditionally Approved</i>
ATC-#13 Toll Plaza Approach Barrier Length	Removal of the 750 foot constant bridge width and concrete median barrier installation between the three ORT lanes and the two traditional toll plaza lanes on the Westchester approach to the toll plaza.	<i>Conditionally Approved</i>
ATC-#14 Toll Plaza Guard Antennas	Use of Guard Antennas during construction of the of the new toll plaza to resolve the issue of EZ Pass interference between the temporarily offset new and existing toll plazas.	<i>Conditionally Approved</i>
ATC-#16 Dock Platform & Dry Dock Facility	Replace the dry dock facility with either a shiplift system or gantry cranes capable of allowing the maintenance of vessels out of the water. This facility would be located at the easternmost end of the dock.	<i>Not an ATC, can be used in Proposal</i>
ATC-003 Use of Existing Bridge for Temporary Access Trestle	Use of a temporary access trestle that is supported on beams spanning between existing bridge foundations for the causeway portion of the existing bridge.	<i>Conditionally Approved</i>
ATC-005 Eliminate Dredge Prism Armoring	Use of shallow draft tug boats and 3:1 dredging channel side slopes in lieu of installing 450,000 CY of armor material along the dredging channel.	<i>Conditionally Approved</i>
ATC-006 Dredge Prism Slope Reduction	Use of 3:1 access channel side slopes rather than the 10:1 side slopes specified in the RFP along the dredging channel.	<i>Conditionally Approved</i>
ATC-008 Rockland Approach Spans - Constant 36' Minimum Median	Provide a constant 36 foot minimum median between the eastbound and westbound Rockland approach bridges through to the Rockland Landing abutment.	<i>Conditionally Approved</i>
ATC-009 Use of High Strength Reinforcing Bars in Foundations	Use of ASTM A 615 Grade 75 galvanized (ASTM A 767 Class I coating) reinforcing bars in addition to the reinforcing bars specified in the RFP for foundation design.	<i>Approved</i>

ENVIRONMENTAL COMPLIANCE PLAN

ATC Name	Description	Response
ATC-010 Floating Caisson Removal/Demolition	Demolition of existing caissons at Pier 169-172 using a combination of chopper beams, hydraulic shears, and hydraulic hammers in order to collapse the structures into themselves. Demolished material would remain within the void spaces below the river bottom mud line.	<i>Conditionally Approved</i>
ATC-011 Use of a Combination of Post Tensioning Bars and Strands in Precast Concrete Columns	Use of precast concrete column segments which would be secured to the pile caps using a combination of galvanized or stainless steel ASTM A722 150 ksi post tensioning bars and ASTM A416 270 ksi Low-Relaxation Prestressing Steel Strands.	<i>Not an ATC, can be used in Proposal</i>
ATC-012 Use of Post Tensioning Bars	Use of ASTM A722 galvanized or stainless steel post tensioning bars for precast concrete piers having an ultimate stress of 150ksi.	<i>Not an ATC, can be used in Proposal</i>

Appendix B:

Environmental Compliance Team Resumes



John Duschang

Environmental Compliance Manager

Overview of Years of Experience

- **18 Years of Experience Performing Similar Work**
- **18 Years with HDR**

Highlights of Professional Qualifications

- Led numerous large-scale projects to success with critical environmental compliance requirements and fast-paced deadlines
- Champlain Hudson Power Express Environmental Lead for submarine cable siting; advised on regulatory permit requirements for this proposed 1,000 MW HVdc underwater and underground transmission cable
- Provided project permitting assistance for the NEPTUNE Regional Transmission System™ (RTS), a proposed 54-mile 600-MW high-voltage direct-current submarine electric transmission cable
- Project manager for the Bayonne Bridge Environmental Screening and Alternatives Analysis; currently providing quality control for the design team

Education

- B.S., Fisheries Sciences, University of Vermont

Training and Certifications

- OSHA 40-hour
- HAZWOPER training with annual refreshers
- Adult CPR and Standard First-aid
- American Fisheries Society, Member



Summary of Capabilities

Mr. Duschang is a Senior Project Manager and responsible for managing and directing HDR's New York Environmental Permitting and Compliance staff. He has over 18 years of demonstrated experience in the environmental permitting process and associated requirements, environmental design, and construction management and compliance on large, complex transportation and other infrastructure projects in environmentally sensitive areas, including the Hudson River. He has direct experience in preparing permit applications, performing permit compliance monitoring and ensuring environmental commitments established during federal and state project reviews, including National Environmental Policy Act (NEPA) Environmental Impact Statements (EIS) and State Environmental Quality Review Assessments (SEQRA).

Mr. Duschang has overseen and managed environmental compliance staff on a variety of design and construction-related issues, including stormwater pollution prevention plan compliance, erosion and sediment controls, protection of endangered species, dredging and dredged material handling and wetland protection, monitoring and mitigation. He has worked with multi-disciplinary engineering design teams and construction staff to resolve constructability and permit restriction issues, reviewed highway, bridge and utility engineering drawings and concepts to confirm permit compliance, and has negotiated and provided science-based, defensible recommendations for monitoring and mitigating potential adverse effects associated with various transportation and infrastructure projects, as related to New York State Protection of Waters (Article 15), Tidal Wetlands (Article 25) and 401 Water Quality Certificate Programs; and U.S. Army Corps of Engineers (USACE) Section 10 (River and Harbors Act) and Section 404 (Clean Water Act) permits; U.S. Coast Guard Section 9 (Bridges) permits; NOAA

Experience Relevant to the TZHRC Project

- ✓ **18 years of experience in the environmental permitting process and associated requirements**
- ✓ **Environmental design and construction management and compliance on large, complex projects**
- ✓ **Permit applications, permit compliance monitoring, ensuring environmental commitments**
- ✓ **Experienced in all facets of projects with significant dredging requirements**
- ✓ **Coordinated, implemented, and participated in public hearings and meetings**

Fisheries Section 305(b)(2) of the Mansuson-Stevens Fishery Conservation and Management Act essential fish habitat (EFH) assessments; and U.S. Fish and Wildlife Service Section 7 Consultations.

Project Experience

Bayonne Bridge Navigational Clearance Program (BBNCP), Bayonne, New Jersey/Staten Island, New York, Port Authority of New York & New Jersey – Environmental Screening and Alternatives Analysis Project Manager (2010 – 2011). Mr. Duschang was the Project Manager for the Environmental Screening and Alternatives Analysis. In this role, Mr. Duschang identified and removed from further consideration those alternatives that did not meet the established Purpose and Need of the BBNCP and to provide a basis for the future environmental analysis of select alternatives under NEPA requirements. HDR assessed environmental impacts relative to regulatory permitting requirements and aquatic impacts for several alternatives, particularly for bridge replacement and rehabilitation options. The study also identified right-of-way constraints, navigation requirements, environmental considerations (dredged material disposal, wetlands, endangered species), permit requirements, costs and construction feasibility. Currently, Mr. Duschang is the Environmental Permitting QA/QC Lead for the engineering design team.

Champlain Hudson Power Express, Hudson River, New York, Transmission Developers Inc. – Environmental Lead (2008 – Ongoing). Mr. Duschang serves as the Environmental Lead for submarine cable siting and advises on regulatory permit requirements for this proposed 1,000 MW HVdc underwater and underground transmission cable from the U.S.-Canada border to the New York Metropolitan area via Lake Champlain and the Hudson River. Mr. Duschang was responsible for conducting the pre-feasibility and evaluating potential impacts to environmentally-sensitive areas within the Hudson River, navigation, commercial fisheries, and water quality due to re-suspension of sediments and contaminants. Currently, Mr. Duschang is working with the engineering team to develop the Environmental Management and Construction Plan on in-water work standards, that will be acceptable to federal and state agencies for ensuring permit compliance.

Neptune Regional Transmission System, Hempstead, New York/Sayreville, New Jersey, Prysmian Cables and Systems – Environmental Permit Manager (2001 – 2007). Mr. Duschang successfully negotiated environmental permit conditions with federal and state agencies and local officials in New York and New Jersey, including the New York State Department of Environmental Conservation (NYSDEC), New Jersey Department of Environmental Protection (NJDEP), National Marine Fisheries Service (NMFS) and the U.S. Army Corps of Engineers (USACE).

Immediate Rehabilitation and Repair of Greenville Yard Lift Bridge, Jersey City, New Jersey, Port Authority of New York & New Jersey – Project Manager (January 2012 – December 2012). The PANYNJ is currently advancing the Cross Harbor Freight Program, with the goal of improving goods movement throughout the region. As part of this program, PANYNJ is undertaking several immediate freight network improvements in various locations in New York and New Jersey, including the Greenville Yard located in Jersey City, NJ. Due to deteriorated conditions, the PANYNJ are pursuing immediate repairs to an existing lift bridge at the site. Mr. Duschang was responsible for environmental permits.



Minelly De Coo

Professional Experience

Ms. De Coo is an environmental engineer at HDR. She has been involved in projects including environmental impact assessments and Categorical Exclusions. Ms. De Coo has been responsible for performing calculations related to air, noise, stormwater and wastewater management, and energy, as well as conducting hazardous materials and floodplain assessments. She has experience compiling and organizing data from municipal, government and online sources.

HDR Project Experience

DSNY, Review Avenue Transfer Station, Queens, NY. Environmental Engineer. Ms. De Coo was responsible for assisting in the modeling of existing and projected air calculations for the proposed marine transfer station. She also assisted in the modeling of noise at the transfer station. The project involved complex air analyses, with extensive work in AutoCAD, CALRoads, Mobile6.2, BEEST and Excel.

DSNY, West 59th Street Marine Transfer Station, Manhattan, NY. Environmental Engineer. Ms. De Coo was responsible for modeling existing and projected air calculations for the proposed improvements of marine transfer station. The project involved complex air analyses, with extensive work in CALRoads, Mobile6.2, BEEST and Excel.

Lafarge North America, Ravena Cement Manufacturing, Ravena, NY. Environmental Engineer. Ms. De Coo assisted in various aspects of the environmental review and analysis for the cement manufacturing plant in Ravena. Ms. De Coo assisted with the noise monitoring and assessment as well as document preparation and community outreach.

New York State Dept of Trans, Region 11, Rehabilitation of BQE (I-278) from Atlantic Avenue to Sands Street, Brooklyn, NY, Long Island City, NY. Environmental Engineer. Ms. De Coo was responsible for performing analyses for chapters in the Tiered Environmental Impact Statement for the Rehabilitation of the Brooklyn-Queens Expressway. She was responsible for land use and zoning, visual impact, groundwater quality, and a draft section 6(f)(3) evaluation and assisted in the preparation of the air quality assessment. She was also responsible for creating and revising the maps using ArcGIS software.

NYCDCP, Bronx Rezoning, Webster Avenue & Third Avenue/Tremont Avenue, Bronx, NY. Environmental Engineer. Ms. De Coo was responsible for performing assessments of existing and future energy and infrastructure needs and conditions for the projected redevelopment of Webster Avenue and Third Avenue/East Tremont Avenue in the Bronx. She was also responsible of conducting a hazardous materials assessment of the areas as per guidelines established in the City Environmental Quality Review (CEQR) Technical Manual.

NYCDCP, Lower Concourse Rezoning, New York, NY. Environmental Engineer. Ms. De Coo was responsible for performing hazardous materials research and calculations under City Environmental Quality Review (CEQR) for the projected redevelopment of the Lower Concourse. The project involved the rezoning and redevelopment of primarily vacant land to commercial and residential area.

NYCDEP-BEPA, Silviculture Regulatory Inventory and Assessment, New York, NY. Environmental Engineer. Ms. De Coo was responsible for assisting in the development of a database of permits and approvals that may apply to silviculture within the watershed areas

Education

Bachelor of Science, Civil Engineering,
Polytechnic University of NY, 2009

Professional Registrations

Professional Affiliations

American Society of Civil Engineers
(ASCE), Metropolitan, Member, 2010-
Present

HDR Tenure

4 Years

Industry Tenure

4 Years

east and west of the Hudson River. The project involved examining regulations at the federal, state, county and municipal levels and determining their applicability, relevance and any exemptions associated with the regulations.

NYCDOT, Bus Rapid Transit (BRT) System on 1st and 2nd Avenues, Manhattan, NY. Environmental Engineer. Ms. De Coe was responsible for performing research and calculations to determine existing infrastructure and energy uses in the project area as well as the potential effects of the project on the city's systems. She was also responsible for assessing floodplain boundaries and elevations within the project area. The project required following the guidelines established for a Categorical Exclusion (CE) documentation.

NYCDOT, Bus Rapid Transit (BRT) System on Nostrand and Rogers Avenues, Brooklyn, NY. Environmental Engineer. Ms. De Coe was responsible for performing research and calculations to determine potential effects of the project on the city's infrastructure and energy. The project required following the guidelines required for a Categorical Exclusion (CE) documentation.

NYSDOT, Corridor Study of Interstate 81 Between I-481/81 Interchanges 16A and 29, Syracuse, NY. Environmental Engineer. Ms. De Coe was responsible for evaluating groundwater quality and floodplains within the project study area. The assessment required extensive research of the groundwater regime of the area including locations of aquifers and water supply wells and floodplain boundaries as defined by FEMA.



Overview of Years of Experience

- **14 Years of Experience Performing Similar Work**
- **1 Year with HDR**

Highlights of Professional Qualifications

- Environmental Compliance Manager of NJ Transit/PANY&NJ Access to Region's Core (ARC) Project during Final Design and construction.
- Environmental Engineering Manager of MTA-NYCT No. 7 Subway Extension Project during Final Design
- EIS Manager of MTA-LIRR Main Line Corridor Improvements Project
- EIS Manager of GDOT Atlanta – Chattanooga High-Speed Ground Transportation Project
- Deputy EIS Manager of NYCDOP/MTA-NYCT No. 7 Subway-Hudson Yards Rezoning Project

Education

- B.S., Environmental Science & Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY, and New York State Ranger School, Wanakena, New York.

Registrations and Licenses

- American Institute of Certified Planners, American Planning Association
- LEED Accredited Professional, U.S. Green Buildings Council,
- ISA Arborist Certification, New York – No. 0553A, 1997

Training and Certifications

- Wetland Delineator Certification, 1999
- 40 Hour Health and Safety Training, 1998



Summary of Capabilities

Mr. Gillespie is an environmental planning and permitting manager with 14 years of experience with environmental assessment and compliance for a diverse range of projects, including, highway/bridge, transit/rail, energy/power, and facilities development. Mr. Gillespie has extensive permitting experience as the environmental compliance manager for the NJ Transit/PANY&NJ Access to Region's Core (ARC) Project and numerous transportation projects expediting approvals including: US Army Corps permits, NYSDEC Tidal/Freshwater Wetlands permits and Water Quality Certifications, NYSDEC Remedial Action Work Plans, NYSOGS Underwater Land Conveyance, NYSDOS Coastal Zone Consistency, Erosion and Sediment Control Plans, Storm Water Pollution Prevention Plans, NYSHPO Section 106 consultations and USFWS Section 7 consultations. Mr. Gillespie has also been responsible for the preparation and management of environmental impact statements, environmental assessments and compliance documentation following the National Environmental Policy Act (NEPA), the Federal Highway Administration Environmental Impact Procedures (23CFR 771), the Federal Transit Administration, the New York State Environmental Quality Review Act (SEQR), the New York City Environmental Quality Review (CEQR) and the New Jersey Executive Order 215 process. Mr. Gillespie has also managed asbestos abatement, lead-based paint abatement, and soil and groundwater remediation projects in New York.

Experience Relevant to the TZHRC Project

- ✓ **Environmental Compliance Manager of ARC Project**
- ✓ **Previous experience with Tappan Zee Bridge/I-287 Corridor Environmental Review**
- ✓ **Over 14 years of permitting experience for transportation projects in New York State**
- ✓ **Expertise in expediting and coordinating permit requirements of mega infrastructure projects**

Project Experience

Bayonne Bridge Navigational Clearance Program (BBNCP), Bayonne, New Jersey/Staten Island, New York, Port Authority of New York and New Jersey – Environmental Permitting Supervisor (2011 - 2012).

Mr. Gillespie is currently advising the federal and state permitting processes for Port Authority's major bridge modification project to allow passage of large freight container ships within the New York Harbor/Newark Bay. HDR assessed environmental impacts relative to regulatory

permitting requirements and aquatic impacts for the final design of bridge rehabilitation and modifications. Mr. Gillespie has identified USACE, NYSDEC, NYSOGS, NYSDOS, NYCDEP, NJDEP and other local permit requirements, through the review of right-of-way constraints, navigation requirements, environmental considerations (dredged material disposal, stormwater and outfall discharges, wetlands, endangered species, contaminated sites), costs and construction feasibility. Managing this vital project requires intense communication with PANYNJ and timely production, as the permit approvals have to be expedited efficiently to achieve the aggressive project schedule.

Access to Region's Core Trans-Hudson Express Tunnel Project, Newark, NJ, NJ Transit/Port Authority of New York and New Jersey – Environmental Compliance Manager (2007 - 2011).

Mr. Gillespie was the Environmental Compliance Manager for the Final Design of all 25 contracts of the Access to Region Core (ARC) Project. He led the Post-Record of Decision (ROD) NEPA coordination effort and technical memoranda to document design changes and associated environmental impacts to allow construction within 3 ½ months of receiving the ROD. Mr. Gillespie was responsible for the overall environmental compliance and permitting for the project, including: US Army Corps Section 10/404 Permit, NYSDEC Tidal Wetlands Joint Application Permit, NYSOGS Underwater Land Conveyance, NYCDEP Tunnel Permit, NYSDEC and NJDEP Water Quality Certification, NYSDOS Coastal Zone Consistency, Soil and Erosion Control Plans, NJPDES Stormwater Permits, NJ Meadowlands District Master Plan compliance, NJDEP Waterfront Development Permit, NJDEP Flood Hazard Area Permit, NJDEP Reforestation Plan approval, NJDEP Green Acres Diversion guidance, NJDEP Tidelands Conveyance guidance and New York City ULURP guidance.

Tappan Zee Bridge/I-287 Corridor Environmental Review, Rockland and Westchester Counties, NY, New York State Thruway Authority/New York State Department of Transportation/MTA-Metro North – Technical Reviewer (2007 - 2009).

Three New York State transportation agencies sponsored a major transportation corridor study between Rockland and Westchester Counties of New York along the Route I-287 corridor and Tappan Zee Bridge to identify vital mobility improvements to the area. The study considered a comprehensive review of alternatives including Tappan Zee Bridge replacement/expansion, new MTA-Metro North services, and Route I-287 improvements. Mr. Gillespie provided technical review for the draft ecology, geology, cultural resources, wetlands and natural resources chapters and technical environmental memoranda.

Bronx Approach to Whitestone Bridge Deck Replacement and Rehabilitation, Bronx, NY, New York State Department of Transportation – Environmental Task Leader (2006 - 2007). As part of the replacement and rehabilitation of the Whitestone Bridge, Mr. Gillespie performed an ecological study and wetland delineation for the bridge rehabilitation project. To complete the environmental compliance documentation, Mr. Gillespie prepared the Environmental Assessment, wetland delineation report, and coordinated wetland permitting efforts with NYSDEC and USACE for the project.

Marine Parkway Bridge Mechanical and Electrical Rehabilitation, Brooklyn, NY, MTA – Triborough Bridge and Tunnel Authority – Permitting Task Leader (2012 - Present). Mr. Gillespie is leading the federal and state permitting approvals for the rehabilitation of Marine Parkway Bridge in Jamaica Bay, Brooklyn, NY. To achieve environmental compliance for the project, Mr. Gillespie is preparing the USACE Nationwide Permit, NYSDEC Tidal Wetland/Water Quality Certification, NYSDEC and NYCDEP petroleum bulk storage approvals, US Coast Guard approval, NYSDOS Coastal Zone Consistency, and NYSPHO compliance documentation for this historic bridge.

Cross Hudson Cable Project, Bergen and Hudson Counties, NJ and Manhattan, NY, PSE&G/Con Edison – Environmental Permit Manager (2007 - 2009). Mr. Gillespie led the environmental permitting compliance for the design and permitting contract. He managed the preparation of the joint USACE Section 10/404 permit/NYSDEC Tidal Wetlands Permit/Water Quality Certificate, NYSDOS Coastal Zone Consistency Determination and several State and City environmental permits.



Valerie M. Whalon

Senior Biologist

Education

Master of Science, Fishery Sciences
(Marine/Estuarine Environmental Science),
University of Maryland System, 1999

Bachelor of Science, Marine Biology
(Marine Science), Richard Stockton College
of NJ (Degree not complete)

Professional Registrations

Professional Affiliations

HDR Tenure

9 Years

Industry Tenure

19 Years

Professional Experience

Ms. Whalon is a Senior Ecologist and Project Manager with 18 years of experience in environmental, marine and fisheries science. Ms. Whalon specializes in Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA), Endangered Species Act (ESA), and NEPA. Her experience includes essential fish habitat fish (EFH) consultations, ESA Section 7 consultations, Federal Coastal Consistency Determinations, NEPA document preparation, fisheries data analysis, data base management, fishery management plan (FMP) preparation, and biological surveys. Ms. Whalon has assisted on and managed a variety of projects for U.S. Army Corps of Engineers (USACE), U.S. International Boundary and Water Commission (USIBWC), U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management, Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), U.S. Coast Guard (USCG), the Environmental Protection Agency (USEPA), Department of Defense (DOD), Air Mobility Command (AMC), Naval Facilities Engineering Command (NAVFAC), Pacific Air Forces (PACAF), and Air National Guard (ANG). She has planned, coordinated, and participated in a variety of biological surveys, including migratory bird nest surveys, reconnaissance-level biological surveys, and vegetation mapping. Ms. Whalon has provided DHS, CBP natural resources support for their tactical infrastructure program on the U.S./Mexico border since 2007. In this role, she primarily provides support for threatened and endangered species issues.

HDR Project Experience

BA of the Construction, Operation, and Maintenance of the New Customs and Border Protection, U.S. Border Patrol, Naco Station, Tucson Sector, Arizona (2009-2010).

Senior Environmental Scientist. Ms. Whalon is managing the development of the BA. The primary focus of the BA is to assess the impact of the increase in water use associated with the expansion of the Naco Station on threatened and endangered species in the Upper San Pedro River. Ms. Whalon also lead the biological survey of the project area, that supports the BA.

Biological Assessment (BA) for the Knik Arm Bridge and Toll Authority (KABATA), Anchorage, AK (2010). Senior Marine Ecologist. Ms. Whalon is supporting the preparation of the BA and ESA Section 7 consultation for the Knik Arm Crossing project. This focus of the BA and consultation is the effect of the Knik Arm Crossing on Cook Inlet beluga whales and proposed critical habitat for Cook Inlet beluga whales. Ms. Whalon is also supporting the development of comments on proposed Designation of Critical Habitat for Cook Inlet Beluga Whales.

Biological Assessment, Tule Wind Project for the BLM, San Diego, CA (2010). Ms. Whalon was the task manager for the preparation of the Biological Assessment (BA) and Section 7 consultation for the Tule Wind Project. The focus of the BA and consultation is the effects of the wind project on Quino checkerspot butterfly and peninsular bighorn sheep.

EA and EBS of Privatization of Military Family Housing at Pope Air Force Base, North Carolina, AMC, Fayetteville, NC (2006). Senior Environmental Scientist. Ms. Whalon was responsible for describing baseline conditions and assessing impact of the proposed privatization of military family housing units at Pope AFB on various resource areas. The proposed action included termination of a land lease with Fort Bragg,

conveyance of 627 units and associated facilities and utilities, transfer of responsibility for providing housing to a private developer, interior and exterior renovation of 330 units, demolition of four units, and construction of a new road. The military family housing units consisted of a mixture of new, older, and historic homes. The project was complicated by the existing lease and prior industrial development of the project area. Ms. Whalon also assisted on the EBS for this project.

EA for Establishing an Eagle Flag and Contingency Skills Training Campus, HQ AMC, Lakehurst, NJ (2006-2007). Senior Environmental Scientist. Ms. Whalon was responsible for describing baseline conditions and assessing the impacts of establishing an Eagle Flag and Contingency Skills Training Campus on infrastructure, biological resources, and geological resources at Naval Air Engineering Station (NAES) Lakehurst. The proposed action occurs in the pine barrens in New Jersey and includes clearing trees, increases in impervious surfaces, construction of new buildings, increases in personnel, aircraft operations, drop zone operations, convoy training, combat patrol training, and other training exercises.

EA for the Proposed Construction of Tactical Infrastructure, United States Border Patrol (USBP) Del Rio Sector, CBP, TX (2007-2008). Ms. Whalon was the Project Manager for the EA for the CBP proposal to build approximately 4 miles of pedestrian fence along the U.S./Mexico international in the cities of Del Rio and Eagle Pass, TX. Ms. Whalons responsibilities include coordinating the EA team, performing data collection, agency coordination and public involvement efforts, and interfacing with USBP Del Rio Sector on all aspects of the project. Ms. Whalon tracked the development of Cultural and Biological Resources Surveys and the NHPA Section 106 and ESA Section 7 consultations for the Proposed Action.

EA of Base Realignment and Closure Activities at McGuire AFB, New Jersey, USAF AMC, NJ (2007). Senior Environmental Scientist. Ms. Whalon was responsible for the infrastructure section of the EA. This required describing baseline conditions and assessing the impacts of BRAC activities at McGuire AFB and Fort Dix, New Jersey. The EA analyzes all projects associated with the BRAC, such as construction, renovation, and infrastructure improvement activities at Fort Dix and McGuire AFB.

EA of Establishing Military Training Routes in the Hawaiian Island Chain and Construction of a Combat Mobility Element Facility at Bradshaw Army Airfield, Hawaii, 15 AW PACAF, Island of Hawaii, HI (2006-2007). As a senior biologist, Ms. Whalon was responsible for describing baseline conditions and assessing the impacts of establishment of Military Training Routes (MTRs) in the Hawaiian Island Chain on biological resources. The proposed action is to establish two MTRs, increase utilization of the Mikilua Drop Zone, and construct a Combat Mobility Element (CME) Facility. The analysis involves the effects of aircraft flights over sensitive areas and the effects of drop zone operations and construction on sensitive biological resources at the Phakulua Training Area, HI.

EA of Military Construction, Navy Reserve P534, Operations Facilities for Mobile Inshore Undersea Warfare Unit 110 and Inshore Boat Unit 13 at Portland Air National Guard Base, Oregon, ANG, Portland, OR (2006-2008). Ms. Whalon was the Project Manager for the EA for the Oregon ANG proposal to provide a dedicated location at Portland ANG Base for the two component units of Naval Coastal Warfare Group One (NCWG-1), the Mobile Inshore Undersea Warfare Unit 110 (MIUWU-110) and Inshore Boat Unit 13 (IBU-13). The EA presents baseline conditions and assesses the potential impacts of construction and operation of the proposed action on various resource areas. Ms. Whalons responsibilities include coordinating the EA team, performing data collection, agency coordination and public involvement efforts, and interfacing with Oregon ANG and Navy personnel on all aspects of the project. Ms. Whalon worked with ORANG and



Overview of Years of Experience

- **12 Years of Experience Performing Similar Work**
- **11 Years with HDR**

Highlights of Professional Qualifications

- Environmental Monitoring
- Noise Task Leader
- Noise/Air Monitoring
- Noise/Air Modeling

Education

- Master of Science, Environmental Engineering, Manhattan College
- Bachelor of Science, Environmental Engineering, Manhattan College

Registrations and Licenses

- Professional Engineer, New York, No. 084926

Training and Certifications

- OSHA, Certified 10-hour Construction Training, 2005
- HAZWOPER 8-hour Refresher, 2007

Summary of Capabilities

Ms. Santiago is a senior project engineer at HDR. She has diverse experience, including noise monitoring and noise analysis, air quality analysis, waterfront permitting, site assessment, site investigation, site remediation, and dredging.

Experience Relevant to the TZHRC Project

- ✓ **Project Manager for West Village Residences, LLC Mitigation Monitor Project**
- ✓ **Environmental Coordinator for Atlantic Yards Development Project**
- ✓ **Noise Task Leader for NYSDOT, DSNY, and NYCDEP projects**

Project Experience

West Village Residences, LLC – Mitigation Monitor, New York, New York, Rudin Management – Project Manager (2012 - Present). Ms. Santiago is the project manager for the West Village Residences, LLC project that involves the development of private residences at the former Saint Vincent's Hospital, New York, New York. HDR, as the mitigation monitor, will monitor compliance with the project environmental commitments including diesel emissions, noise mitigation, dust suppression, spill remediation, and CHASP monitoring.

Atlantic Yards Owner's Representative – Mitigation Monitor, Brooklyn, New York, Empire State Development Corporation (ESDC) – Environmental Coordinator (2008 - Present). Ms. Santiago was the environmental coordinator for the Atlantic Yards project that involves the development of a major new complex that will occupy an approximately 22-acre site in the Atlantic Terminal area of Brooklyn, New York. The site will include the development of a basketball arena, 16 mixed use buildings, a reconfigured Long Island Rail Road yard and 8 acres of publicly accessible open space. Ms. Santiago was responsible for providing technical guidance to the mitigation monitor regarding compliance with the environmental commitments including diesel emissions, noise mitigation, dust suppression, spill remediation, and CHASP monitoring. Ms. Santiago also provides a QA/QC review of the quarterly field reports.



Downstate Region Noise Term Agreement, Various Locations, New York, New York State Department of Transportation – Task Leader. (January 2012 - Present). Ms. Santiago is a task leader for the NYSDOT Noise Term Agreement for the Downstate Regions (Regions 8, 10 and 11). Tasks will include noise monitoring, noise analyses using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) and preparing noise study reports.

New York City Solid Waste Management Plan, New York, New York, New York City Department of Sanitation (DSNY) – Noise & Air Specialist (2001 - Present). Ms. Santiago is responsible for all noise analyses and air quality analyses conducted for environmental reviews related to the preparation and implementation of the New York City Solid Waste Management Plan (SWMP). She is responsible for conducting stationary and mobile air quality analyses using the AERMOD Model and the CAL3QHCR model, respectively, to determine compliance with the U.S. Environmental Protection Agency (USEPA) National Ambient Air Quality Standards (NAAQS), the New York State Department of Environmental Conservation (NYSDEC) Guidelines for the Control of Toxic Ambient Air Contaminant, and the NYSDEC and New York City Department of Environmental Protection (NYCDEP) Interim Guidance for PM_{2.5} analyses. Ms. Santiago is responsible for conducting noise screening, noise monitoring and noise analyses in accordance with the New York City Environmental Quality Review (CEQR) Technical Manual, as well as the Title 6, Part 360 of the State of New York Codes, Rules and Regulations (6 NYCRR Part 360) Solid Waste Management Facilities Section 360-1.14(p). She also participates in meeting's that are with held with the Client and/or the NYCDEP.

Ravena Cement Plant Modernization, Ravena, New York, Lafarge North America – Noise Specialist (2008 - 2011). Ms. Santiago is the task leader for the noise assessment being conducted to fulfill the requirements of New York State's Environmental Quality Review Act (SEQRA) and obtain the environmental approvals and permits necessary to modernize the Lafarge North America Ravena Cement manufacturing plant in Ravena, New York. The modernization project under consideration entails the replacement of the existing two wet kilns with a single dry precalciner kiln line. Ms. Santiago is responsible for conducting noise screening, noise monitoring and noise analyses in accordance with applicable rules and regulations.

Nostrand/Rogers Avenues Bus Rapid Transit (BRT) System, Brooklyn, New York, New York City Department of Transportation – Noise & Vibration Specialist (2009 - 2011). Ms. Santiago was the task leader for the noise and vibration assessment being conducted in accordance with the New York City Environmental Quality Review (CEQR) Technical Manual and the Federal Transit Administration (FTA) Transit Noise and Vibration Impact and Assessment. The noise and vibration assessment is being conducted to fulfill the requirements of the Categorical Exclusion with documentation (CE(d)) in conformance with the National Environmental Policy Act (NEPA) guidance for the implementation of a Bus Rapid Transit System (BRT) along the Nostrand Avenue and Rogers Avenue corridor in Brooklyn, New York. In addition, Ms. Santiago was also responsible for coordinating the air quality analyses being conducted in accordance with CEQR and federal conformity standards.

United Water Desalination Plant, Rockland County, New York, United Water New York – Noise & Vibration Specialist (2008 - 2009). Ms. Santiago was the task leader for the noise and air quality assessment conducted to fulfill the requirements of New York State's Environmental Quality Review Act (SEQRA) for the construction and operation of a 7.5-million-gallon-per-day water treatment facility. She was responsible for conducting noise screening, noise monitoring and noise analyses in accordance with applicable rules and regulations, as well as preparing a qualitative air quality assessment.

EDUCATION

Master Urban Planning, Planning, University of Pennsylvania, 1977

Bachelor of Engineering, Chemical Engineering, Rensselaer Polytechnic Institute, 1966

PROFESSIONAL AFFILIATIONS

- American Institute of Chemical Engineers (AIChE), Member
- American Planning Association, Member

HDR TENURE

7 Years

INDUSTRY TENURE

46 Years

PRESENTATIONS & PUBLICATIONS**Presentations**

- James R. Brown, Samuel P. Less, Kovid Saxena, "Integrating the Consideration of Climate Change - The Assessment of Greenhouse Gas Emissions in Environmental Impact Statements", National Association of Environmental Professionals 35th Annual Conference, Atlanta, GA, 4/27/2010

CONTACT

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New York, New York 10018
P. 212.542.6000
F. 212.542.6100

**Experience Overview**

Mr. Brown serves as Northeast Director of Transportation Environmental Programs for HDR. He has four decades of experience in the planning and environmental fields, and has worked on a broad range of infrastructure, development and transportation projects in over half the states in the union, including planning and environmental studies for virtually every type of transportation mode and facility, including for marine facilities, highways, light rail transit facilities, heavy rail facilities, and airports.

Mr. Brown has served as task leader, project manager or principal-in-charge on a wide variety of projects in New York City, including as project manager for on-call planning services for the New York City Economic Development Corporation (NYCEDC), the Port Authority of New York & New Jersey (PANYNJ) and the New York City Department of City Planning (NYCDP).

Project Experience

New York City Economic Development Corporation, On-Call Planning Services Contract, NY. Mr. Brown is the project manager for an on-call planning, environmental and traffic engineering services contract for the New York City Economic Development Corporation. Tasks under the contract included the development of best management practices for the stormwater management, the development of conceptual design for waterfront facilities, and completion of environmental investigations for a range of City initiatives.

Port Authority of New York & New Jersey, Bayonne Bridge Environmental Screening and Alternatives Analysis. Mr. Brown served as deputy project manager responsible for the assessment of alternatives to address the limitations imposed by the existing air draft of the Bayonne Bridge on marine vessels that call on the Port of New York & New Jersey.

New York City Department of City Planning, On-Call Environmental Services, NY. Mr. Brown serves as project manager for an on-call environmental services contract for New York City Department of City Planning, including the development of water quality, infrastructure, and energy impact assessments as part of CEQR EISs for the rezoning of the Lower Concourse, Tremont Avenue, and Webster Avenues corridors.

PANYNJ, Aviation Development Needs Plan, NY/NJ. As the deputy project manager, Mr. Brown was responsible for development of a development needs plan for LaGuardia Airport and a system-wide plan for LaGuardia (LGA), John F. Kennedy International (JFK), and Newark International (EWR) Airports, and coordination of three consultant teams in the development of the master plans for all three airports.

PANYNJ, On-Call Environmental Services, NY/NJ. Mr. Brown was the project manager for an on-call environmental services contract with the PANYNJ Aviation Department, including project manager for the completion of a master plan/capital improvements program for LaGuardia Airport

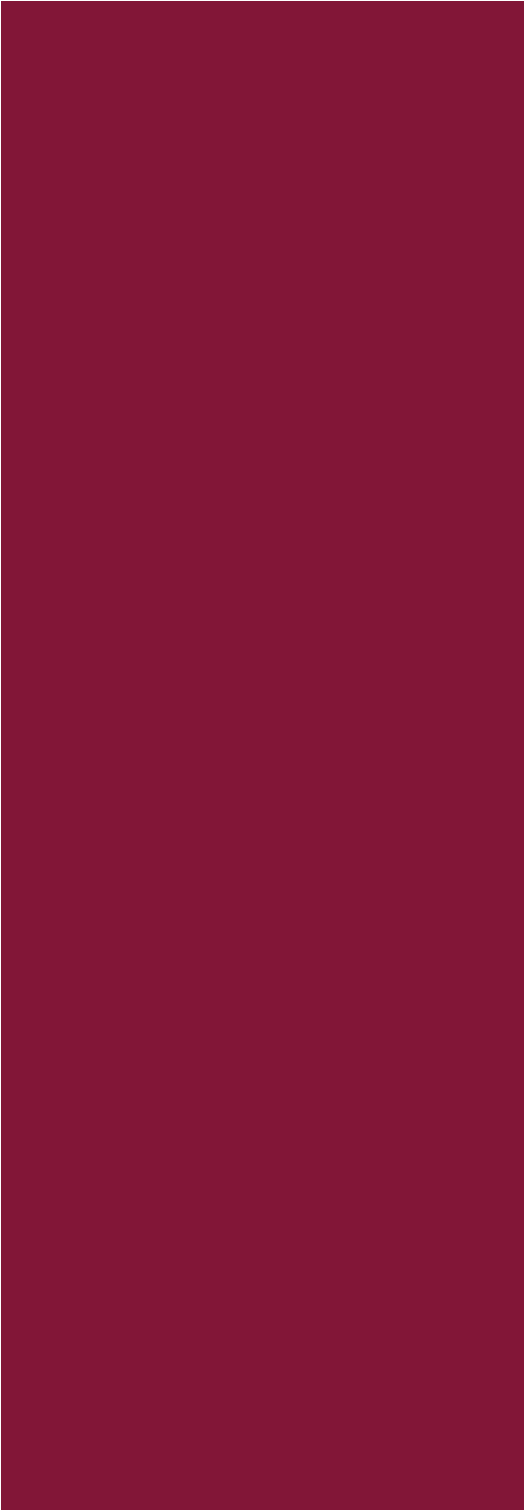
PANYNJ, Runway Overrun Area, LaGuardia Airport, Queens, NY. Mr. Brown serves as principal-in-charge for completion of required environmental reviews for the development runway safety areas for Runway 13-31.

Port Facilities, Various Locations. Team Member. Mr. Brown directed the preparation of two EAs for proposed port facilities in Buenaventura, Colombia, South America, and Kismayo, Somalia, Africa, for projects funded by the World Bank and the United States Agency for International Development (USAID).



JAMES R. BROWN

Principal In Charge



MTA – New York City Transit, Hudson Yards Development Program, New York, NY. Mr. Brown was the deputy project manager for preparing an EIS in conformance to State Environmental Quality Review Act (SEQRA) and City Environmental Quality Review (CEQR) requirements for the extension of the No. 7 Subway, Hudson Yards Rezoning & Development Program, Jacob K. Javits Convention Center Expansion, and Development of a Multi-Use Facility in the Hudson Yards area of the far Westside of Midtown Manhattan for MTA-New York City Transit, the New York City Department of City Planning, the Empire State Development Corporation, and the New York City Convention Center Development Corporation.

New York City Mayor's Office/Public Art Fund, New York Waterfalls EAS, NY. Mr. Brown was project manager for the preparation of an Environmental Assessment Statement and associated environmental studies for the development and operation of temporary waterfalls along the East River as public art attractions in New York City. Included was a detailed assessment of the potential effect of combined sewer overflow events on East River water quality.

Silvercup Studios, Silvercup West EIS, Queens, NY. Mr. Brown served as project manager for the preparation of an EIS in conformance with CEQR requirements for a 2.0 million gross square feet mixed use development along the East River in Long Island City, Queens.

New York City Department of City Planning, Frederick Douglas Boulevard Rezoning EAS. Mr. Brown was the principal-in-charge for preparing an Environmental Assessment Statement and associated land use, environmental and transportation studies for the rezoning of a portion of Frederick Douglas Boulevard in Harlem, New York City for the New York City Department of City Planning.



John M. Guzewich

Project Manager

Education

Bachelor of Science, Environmental Sciences/Studies, State Univ. of New York NY, 1980

Professional Registrations

OSHA 10-Hour Construction Safety, New York, United States, No. Certification No. 001066953 Issued: 10/03/2006, Expires: None Listed, Does Not Expire

OSHA - Permit-Required Confined Space Standard, 29 CFR 1910.146, New York, United States, No. Certification # 95CS0304-04 Issued: 03/04/1995, Expires: None Listed, Does Not Expire

The Hazardous Waste Operations and Emergency Response Standard (HAZWOPER), New York, United States Issued: 03/28/1987, Expires: None Listed, Does Not Expire

Professional Affiliations

HDR Tenure

29 Years

Industry Tenure

32 Years

Professional Experience

Mr. Guzewich is a project manager, a Blue Hill Office Safety Coordinator (OSC), and a member of the HDR Safety Committee. In his capacity as project manager, Mr. Guzewich is responsible for budgeting projects, supervising in-house staff and subcontractors, client interaction, and technical oversight. Mr. Guzewich has worked on a large number of projects involving remedial investigation, PCB contamination projects, volatile and other organic contamination projects, and metals contamination projects. He has worked on hazardous waste sites requiring a wide variety of personal safety protection levels (Level D to Level B). Mr. Guzewich has over 25 years of experience on hazardous waste investigations and remediation in New York, New Jersey, Pennsylvania, and Delaware. He is responsible for initiating field investigation activities for hazardous waste work sites. In this capacity he prepares and reviews field sampling plans (FSPs) and schedules and coordinates on-site efforts with HDR management and field staff, regulatory agencies, and subcontractors.

As a OSC he is responsible for developing and reviewing HASPs for all hazardous and non-hazardous waste investigations. In preparing site-specific HASPs, Mr. Guzewich evaluates the hazards at the site, develops engineering and administrative controls to reduce the hazards, recommends personnel PPE and monitoring equipment to be used on the site, determines the appropriate action levels to be used for upgrading or downgrading PPE, and develops the emergency plan for the site. He is responsible for ascertaining that all employees have the required training for work on hazardous waste sites and is responsible for recommending additional training needs for specific projects. Mr. Guzewich is also responsible for reviewing contractor's HASPs to ascertain whether or not they are in conformance with the specific project specifications, regulations, and requirements. He also oversees in-house and on-site training for HDR hazardous waste field crews. As part of HDR's QA/QC program, he is responsible for performing field audits of procedures and techniques used by HDR and subcontractor's field sampling crews. Mr. Guzewich has extensive experience in sampling surface waters, groundwater, soils, sediments, miscellaneous solid materials, oil, and air at both hazardous and non-hazardous sites. He served as the on-site coordinator (OSC) for many such sampling efforts, particularly for hazardous waste sites (where he has also served as the on-site HSO). Responsibilities include qualitative respirator fit testing; selection and use of PPE including clothing and equipment; sampling procedures and equipment; personnel and equipment decontamination; training in maintenance, calibration, use, and limitations of air monitoring equipment confined space entry training, and adherence to appropriate QA/QC procedures and protocols.

HDR Project Experience

Consolidated Edison Co. Of Ny Inc., Echo Avenue Site Remediation, New Rochelle, NY. Task Manager & Health and Safety Officer. Mr. Guzewich is task manager and health and safety officer (HSO) for a Phase II investigation and remediation of an unused electrical substation in New Rochelle, NY, contaminated with PCBs. He collected sample media and evaluating the data to determine if remediation goals were met, performed community air monitoring, and assisted Con Edison in overseeing the contractor. Mr. Guzewich assisted

with preparation of the summary reports, and draft site management plan.

Dyno Nobel, Explosives Manufacturing Facility - Environmental Audit and Compliance Programs, Port Ewen, NY. Field Operations Supervisor & Health and Safety Officer. Mr. Guzewich prepared the sampling plan and subsequently conducted the soil, wastewater, and air sample collection this explosives manufacturing facility in Port Ewen, NY. He assisted in the inventory of production emission sources and waste explosives stored and then managed and implemented a project to develop sampling procedures for the collection of air samples from the discharge stack of a detonation chamber designed to detonate waste or off-spec explosive devices on-site prior to disposal to ensure the system met the discharge objectives required by the client and NYSDEC. Dyno Nobel received approval from NYSDEC for operation of the detonation chamber after review of the data report prepared by HDR.

Harris Corp., Whiteman, Osterman & Hanna, Remedial Investigation/Feasibility Study, Poughkeepsie, NY. Field Services Supervisor. Mr. Guzewich served as field services supervisor for groundwater sampling activities and O&M for the pump and treat system at this site. He coordinated a sub-slab communication testing investigation to assist in the design of a sub-slab depressurization system for the building.

Hausman Realty, Phase II & Remedial Design for Drycleaning Establishment, Former Mimi Cleaners, Scarsdale, NY. Project Manager. Mr. Guzewich is currently the project manager for the vapor intrusion assessments and mitigation at a former dry cleaning establishments under a Voluntary Cleanup Agreements entered into with the State of New York. The assessment included completion of NYSDOH Indoor Air Quality Questionnaire and Building Inventory reports, sub-slab, indoor air, and ambient air quality sampling and laboratory analyses, and development of mitigative measures. Soils below the slab were removed as much as possible and a vapor extraction system was installed and operated and maintained. Testing and development of a sub-slab depressurization system at this location and other structures in the area is currently being conducted. Initially Mr. Guzewich served as the Task Manager during excavation activities within the building and during installation and O&M activities for an SVE system installed at the former dry cleaning establishment.

ICI, Environmental Site Assessment, Tamaqua, PA. Field Services Supervisor & Health and Safety Officer. Mr. Guzewich was the field services supervisor and health and safety officer during the preparation of the sampling plan and HASP for this explosives manufacturing facility in Tamaqua, PA. He collected soil, groundwater, and air samples at this site. The sampling included difficult and unique air sample collection procedures during actual operation of an outdoor burn facility designed to detonate waste or off-spec explosive devices.

Lehigh Valley Industrial Park Inc, Bethlehem Steel South Side Redevelopment, Bethlehem, PA. Field Services Supervisor. Mr. Guzewich supervised field personnel and activities associated with the project. HDR is the principal project engineer responsible for all environmental aspects of the assessment and redevelopment of largest (over 1,000 acres) privately owned brownfields redevelopment project in the country. The project includes demolition of numerous buildings covering hundreds of thousands of square feet, movement of millions of cubic yards of manmade fill, remediation of numerous former materials handling areas, removal of historical underground chemical handling utilities, and design and environmental coordination required to construct new facilities. HDR oversees all Federal, state, and local permitting and closure approvals. Mr. Guzewich was responsible for collecting surface water, soil, and sediment samples as part of the Feasibility Study.

NYCDEP, NYCDEP, PS-227: Planning, Design, and Design Services During Construction for Reconstruction of Pumping Stations, New Douglaston, Bayswater Avenue, 15th Avenue and 122nd Street Pump Station, Queens County, NY. Field Operations Supervisor & Health and Safety Officer. Mr. Guzewich is supporting this



David M. Winslow, Ph.D., P.G.

Hazardous Materials

Overview of Years of Experience

- **17 Years of Experience Performing Similar Work**
- **8 Years with GZA**

Highlights of Professional Qualifications

- Environmental Site Investigations
- Site Remediation Design
- Hydrogeologic Testing
- Hazardous Materials Surveys

Education

- Ph.D., Geological Sciences, Lehigh University
- M.S., Geological Sciences, Virginia Polytechnic Institute & State University
- B.S., Geology, State University of New York

Registrations and Licenses

- Professional Geologist, New Hampshire, No. 677
- NJ DHSS - Indoor Environmental Consultant/IEHA, #392

Training and Certifications

- List training certificates and effective dates of certification
- OSHA 40-hour Health and Safety Training Certification, 1995
- 8-hour Site Supervisor Certification, 1995
- OSHA Confined Space Entry Training Certification, May 1995
- ASTM Risk Based Corrective Action for Petroleum Contaminated Sites, 1998



Summary of Capabilities

Dr. Winslow is a geologist with professional experience in bedrock, soil and groundwater investigation and remedial design. Dr. Winslow heads up GZA's Green Remediation Initiative and has presented papers on the topic at national symposiums. Dr. Winslow has also conducted, managed and implemented QA/QC practices at hundreds of Phase I and Phase II Environmental Site Assessments/Investigations. In addition, Dr. Winslow has experience in managing environmental compliance and permitting tasks associated with building and infrastructure design and construction projects, including hazardous material surveys, spill prevention and spill response.

Experience Relevant to the TZHRC Project

- ✓ **TransHudson Express Tunnel**
- ✓ **PANYNJ Environmental Engineering Contract**
- ✓ **Beacon Transit Oriented Development**
- ✓ **NYCSCA IEH Hazardous Materials Consulting Services Contract**

Project Experience

TransHudson Express Tunnel-Manhattan Segments, New York, New York, New Jersey Transit – Associate Principal (04/2010 - 12/2010). As part of the design build project for the Manhattan Tunnels Project, Dr. Winslow designed and oversaw the soil and rock characterization of the soils and rock within the shaft and starter tunnels at 29th Street and 12th Avenue. The project involved the excavation of a shaft to a depth of 130 feet below ground surface in order to allow access by the tunnel boring machine. GZA's services included preparation of an In-Situ Soil Sampling and Analysis Plan, a Field Sampling Plan, collection of 190 composite soils samples representing 500 cubic yard cells at five foot lifts, preparation of a field summary report and recommendations to the contractor with regards to disposal of the materials.

Beacon Transit Oriented Development, Beacon, New York, Metro North Railroad – Principal in Charge (07/2009 - 03/2010). As Principal-in-Charge, Dr. Winslow designed and oversaw the environmental assessment, site investigations and conceptual remedial approach in support of the proposed Transit Oriented Development at the MNRR Beacon Station. MNRR was preparing preliminary design for a TOD to be included in a request for proposals to developers. Dr. Winslow designed a Site Assessment program to identify and quantify the environmental liabilities

associated with the development. The study included compilation of existing environmental data on five parcels, including a coal tar impacted parcel, a Phase I Environmental Site Assessment on five parcels, a site investigation to evaluate data gaps, preparation of a conceptual remedial approach, and preparation of remedial cost estimates. The information was designed to be used in the RFP process to reduce uncertainties in the development proposal process.

NYCSCA- PS-312, Queens, New York, New York City School Construction Authority – Principal in Charge (02/2011 - 12/2011). As Principal in Charge, Dr. Winslow managed construction support services related to soil management and community air monitoring associated with the construction of a New York City school complex and associated utility corridors on a NYSDEC Brownfield Site. The site had a long industrial history and was contaminated with petroleum products and historic fill. GZA prepared Excavated Material Disposal Plans, reviewed potential disposal facilities, conducted waste characterization soil sampling, prepared a Community Air Monitoring Plan and conducted community air monitoring consisting of three stations set up to continuously monitor volatile organic compounds and particulates. This was a high profile Site with a lot of attention of the community and the NYSDEC.

PANYNJ Environmental Engineering Contract, Various Locations- New York and New Jersey, Port Authority of New York and New Jersey – Principal in Charge (Ongoing). Dr. Winslow served as the Principal-in-Charge for the PANYNJ Environmental Engineering Contract. Under this Contract, Dr. Winslow, designed and managed site assessments, site investigations and remedial design/implementation at PANYNJ facilities in New York and New Jersey such as a Phase I ESA on a 40 acre portion of Port Elizabeth, New Jersey, UST Removals at JFK Airport and Newark Airport, and remedial investigations and remedial design specifications at LaGuardia Airport.

NYCSCA IEH Hazardous Materials Consulting Services Contract, Various Locations- New York City, New York City School Construction Authority – Principal in Charge (Ongoing). Dr. Winslow served as the Principal-in-Charge and Program Manager for the NYCSCA IEH Hazardous Materials Consulting Contract. Under this Contract, Dr. Winslow, was responsible for client management, technical quality and financial success of work related to site assessments, site investigations and remedial design/implementation at existing and proposed New York City Schools throughout the five boroughs.

Astoria Energy Phase II Project, Astoria, New York, SUEZ Energy Generation NA, LLC – Principal in Charge (09/2008 - 01/2010). As Principal-in-Charge, Dr. Winslow designed and managed an environmental investigation to characterize soils and groundwater as part of the pre-construction design phase of the Astoria Energy Phase II project. The proposed power plant was situated on a former major oil storage facility and was characterized by approximately 10 feet of historic fill material and petroleum contaminated soils and groundwater. The investigation consisted of collecting soils samples in a grid fashion in areas proposed for grubbing, excavation of structures and overhead and subsurface transmission lines to characterize soils for proper handling and disposal. In addition, groundwater samples were collected to evaluate the necessity for treatment of dewatering effluent. Following the investigation, GZA prepared a Site Investigation Report and a Construction Contaminant Management Plan to be used by the contractor for proper health and safety, handling, transportation and disposal of contaminated media. During construction, GZA conducted waste characterization soil sampling for disposal of contaminated material.



RESUME

Education

Ph.D., 2012, Earth & Environmental
Science, Graduate Center - City
University of New York

M.A., 2011, Earth & Environmental
Science, Graduate Center - City
University of New York

B.S., 1998, Environmental Geology,
City University of New York -
Brooklyn College

Professional Registrations

US EPA-NY Certified Lead Risk
Assessor, NY-R-11303-2

US EPA Lead Renovation, Repair,
Painting (RRP) Training

NYS-DOL – AHERA Asbestos
Certificate: Project Monitor, Inspector and
Air Sampling Technician, Certification
90-15278

NYC DEP Asbestos Investigator,
Certification # 115393

New Jersey Lead Inspector/ Risk Assessor,
Permit # R00976

New Jersey Indoor Environmental
Consultant/IEHA, #116

MTA/NYCT Track Safety Certification

Niton XRF Spectrum Analyzer
Manufacturers Training Certification #
A5060838495

Areas of Specialization

Asbestos Construction Management
Industrial Hygiene including IAQ and Mold
Evaluations

Lead-Based Paint Sampling and
Evaluations

Benjamin M. Sallemi, Ph.D.
Senior Project Manager

Summary of Experience

Dr. Sallemi has over 20 years experience as an Environmental Consultant. He has extensive consulting, project management and practical field experience with regard to asbestos abatement projects, performing many NJ DHSS, NJ Sub-Chapter 8 asbestos projects, NYC-DEP “ACP-5 Form” surveys, Phase I Environmental Site Assessments (Phase I ESA), sub-surface hydro-geologic testing and remediation (Phase II), Lead-Based Paint (LBP) testing and remediation issues, and mold sampling and evaluation. He has extensive experience designing abatement specifications and preparing cost estimates for each of the aforementioned environmental disciplines.

Dr. Sallemi has a great deal of experience with redevelopment, renovation, and demolition projects for the private and public sector, including schools, hospitals, and public agencies such as the New York City Economic Development Corporation, New York City Department of Design and Construction, Veterans Administration, and General Services Administration.

He serves as the Health and Safety Officer for GZA’s Northern New Jersey Office, and Mr. Sallemi is an adjunct professor at the Hunter College, Brookdale Campus for Environmental & Occupational Health Sciences in New York City.

Relevant Project Experience

Project Manager, General Service Administration (GSA)/Peter W. Rodino Federal Building Modernization, Newark, New Jersey. Responsible for GZA team providing asbestos consulting services for \$146 million modernization of largest federal building in New Jersey. Scope of work includes asbestos abatement design, including preparation of drawings and specifications; inspection services, and determining worker exposure to potential airborne asbestos and lead contamination.

Project Manager, Holy Name Hospital, Teaneck, New Jersey. Provide asbestos management and lead-based paint evaluation services at a variety of buildings on the hospital campus.

Project Manager, St. Joseph’s Hospital, Paterson, New Jersey. Provided daily oversight and management of GZA personnel for various projects, including a lead and asbestos investigation to aid in the hospital’s day care center license renewal and an asbestos investigation at two vacant houses prior to their complete demolition as part of hospital expansion.

Project Manager, New York University/Center for Urban Science and Progress, Brooklyn, New York. Oversaw asbestos and PCB sampling of 500,000 square foot former MTA building as part of due diligence efforts, as NYU prepared to purchase the downtown Brooklyn facility for its new technology and science center.

Project Manager, Passaic County Community College/Hazardous Materials Inventory, Paterson, New Jersey. As part of a 2010 on-call contract to provide environmental consulting services to PCCC, conducting a Hazardous Materials Inventory of a former furniture store



on Market Street which will be renovated to accommodate PCCC expansion.

Project Manager, TransCanada – Ravenswood Power Generating Station, L.I.C., Long Island City, New York, New York. GZA provided a host of environmental services at this site, beginning with emergency spill response and remediation. Dr. Sallemi was responsible for asbestos surveys and sampling of suspect materials throughout the power plant, including the 10-story boilers and roof.

Project Manager, County of Ocean On-Call, New Jersey. As part of an on-call environmental engineering services project with Ocean County developed a database of asbestos-containing materials at county sites so that asbestos issues are effectively identified in advance of work order commencement and safe work practices are implemented.

Project Manager, Yankee Stadium HMI, Bronx, New York. Responsible for team that surveyed entire historic stadium prior to its demolition -- including clubhouse, press box, public areas -- for presence of universal hazardous wastes, asbestos, and lead; quantified amounts; developed cost estimates for pre-demolition sampling; and developed plans and specifications for asbestos abatement and lead-safe work practices. Air monitoring was performed during the asbestos abatement completed prior to demolition.

Project Manager, Columbia University, Manhattanville Redevelopment, New York, New York. Responsible for team that surveyed approximately 50 buildings for hazardous materials, asbestos, and lead, quantified amounts, and developed cost estimates for sampling that will take place prior to demolition. As part of a Community Air Monitoring Plan (CAMP), GZA performed background air sampling around the site's perimeter, prior to the planned utility relocation, demolition, foundation excavation and remediation, and construction activities to establish existing ambient air quality conditions. GZA's air monitoring included Real-Time Monitoring (24/7); Particulates (Respirable PM₁₀, Fine PM_{2.5}); and Total Volatile Organic Compounds (VOCs). Also, Periodic Confirmatory Sampling, using membrane filters: Lead; and Carbon (Soot).

Project Manager, General Services Administration (GSA) Federal Office Building and Courthouse, Hato Rey, Puerto Rico. Performed a limited Hazardous Materials Inventory (HMI) of two federal facilities, built in the 1970s and totaling 750,000 SF, undergoing "green" building modernizations. GZA also responsible for completing remediation design, including scaled drawings and specifications for abatement.

Project Manager, The Salvation Army (TSA), multiple sites in NJ/NY metro area. As part of GZA's Environmental Property Management contract with TSA, directed asbestos, lead-based paint, and mold survey and abatement activities at TSA sites in support of property transactions and facility maintenance. TSA facility types range from single-family residences and multi-story commercial; functional spaces may include dormitories, chapels, kitchen/cafeteria areas, gymnasiums, offices, and/or retail thrift stores.

Project Manager, YWCA, White Plains, New York. Led team that conducted required third-party project monitoring and air sampling during the removal of asbestos-containing materials encountered during renovations of two buildings on the site, totaling approximately 150,000 square feet.

Project Manager, Preliminary Assessments, numerous Day Care Centers throughout New Jersey. Lead GZA project teams that have completed numerous Preliminary Assessments and Indoor Environmental Health Assessments (IEHAs) in day care centers throughout New Jersey, in compliance with all new Jersey Department of Health and Senior Services and ASTM guidelines, as part of the day care's license renewal process.

Project Manager, Confidential Law Firm IAQ, New York, New York. Lead GZA team that provides on-call indoor air quality, asbestos consulting, and mold/bacteria consulting services to law firm, which owns a Class A office building in lower Manhattan and occupies approximately 10 floors, or 250,000 SF, for its own firm.

Project Manager, Parkledge Apartments, Yonkers, New York. Led team that conducted required inspections, third-party project monitoring and air sampling during the removal of asbestos-containing materials in occupied, multi-unit residential hi-rise building. Worked closely with building owner, building manager, multiple trade contractors, and tenants to minimize disruption to occupants. GZA and abatement contractor completed pilot study on proposed "means and methods," implementing in a small area abatement and air



Benjamin M. Sallemi, Ph.D.
Cont'd

A Life-Time Mortality Risk Analysis and Cost Benefit Analysis Associated With Asbestos Exposure From The Collapse of the World Trade Center on 9/11: Does the Cost of USEPA's Residential Dust Clean-up in Lower Manhattan Exceed its Benefit?, Graduate Center – City University of New York, 2012.

Presentations

Adjunct Professor, "Environmental Investigations and Remediations." CUNY/Hunter College Brookdale Graduate School of Health Sciences. 2010-present.

Professional Development

OSHA - Hazardous Waste Operations and Emergency Response (OSHA 40-Hour HAZWOPER)

OSHA - 16-Hour Confined Space Course

OSHA - 10-Hour Construction Safety Course

USDOT/IATA Shipping and/or Transportation of Hazardous Materials



Robert Quiggle

Cultural Resource Compliance

Overview of Years of Experience

- **6 Years of Experience Performing Similar Work**
- **4 Years with HDR**

Highlights of Professional Qualifications

- Mr. Quiggle meets the Secretary of the Interior's Professional Qualification Standards for Archaeology
- National Historic Preservation Act (Section 106) Experience
- Federal and New York State Regulatory Coordination

Education

- Master of Arts, Anthropology/ Archaeology, SUNY Binghamton
- Bachelor of Science Anthropology/ Archaeology, Mercyhurst College

Registrations and Licenses

- Registered Professional Archaeologist (RPA)

Training and Certifications

- Advisory Council on Historic Preservation Section 106 Essentials Course, July 2007, New York City, New York.

Summary of Capabilities

Mr. Quiggle has developed and directed strategies to successfully address issues related to the identification, management, and preservation of archaeological, historical, and cultural resources at projects across New York and the United States. As a Registered Professional Archaeologist, he has served as the technical lead for cultural resources studies and the development of management plans for existing facilities and new developments, transportation infrastructure improvements, hydropower projects, transmission facilities, and fossil fuel plants. Mr. Quiggle has led consultation pursuant to Section 106 of the National Historic Preservation Act (Section 106) with a variety of stakeholders and regulatory agencies, including the Advisory Council on Historic Preservation (ACHP), the U.S. Army Corps of Engineers (USACE), the Federal Energy Regulatory Commission (FERC), State Historic Preservation Officers (SHPO), the New York City Landmarks Preservation Commission (LPC), the U.S. Forest Service, and federally recognized Indian tribes. Mr. Quiggle's experience includes developing, overseeing and implementing cultural resource study plans, archaeological monitoring plans, data recovery plans, Historic Properties Management Plans (HPMP), and components of environmental assessments and impact statements for a diverse group of public and private clients.

Experience Relevant to the TZHRC Project

- ✓ **Development and implementation of unanticipated discoveries plans for projects across New York State**
- ✓ **Directed one of the largest cultural resources studies along the Hudson River corridor for the Champlain Hudson Power Express Project**
- ✓ **Oversaw cultural resources compliance activities for the New York Power Authority**

Project Experience

Champlain Hudson Power Express, Hudson River, New York, Transmission Developers Inc. – Cultural Resources Lead (2008 – Ongoing). Mr. Quiggle is the cultural resources lead for this proposed transmission project in New York State. The project includes installation of underwater/underground transmission cables extending from the U.S./Canadian border to the New York City metropolitan area. As part of the permitting process, Mr. Quiggle managed the development and completion of complex cultural resources studies along more than 300 linear miles of the proposed alignment. These studies included the identification





Christina M. Quiroz

Engineer

Education

Bachelor of Science, Civil Engineering,
Manhattan College, 2003

Professional Registrations

Professional Engineer, New York, United
States, No. 088202 Issued: 06/14/2010,
Expires: None Listed, Does Not Expire

Engineer in Training, New York, United
States Issued: 01/01/2005, Expires: None
Listed, Does Not Expire

Professional Affiliations

American Society of Civil Engineers
(ASCE), Metropolitan, Member

Society of Hispanic Professional Engineers,
Member

Society of Women Engineers, Member

HDR Tenure

7 Years

Industry Tenure

9 Years

Professional Experience

Mrs. Quiroz is a Project Engineer and has experience in civil engineering specializing in projects related to land development civil design, water resources, transportation, and construction administration. Her experience includes civil engineering design, design improvements for a wastewater treatment facility, cost estimation, permitting and construction support services for commercial, residential, recreational, industrial and public works type projects. Mrs. Quiroz's experience ranges from preparing preliminary planning plans and reports to developing civil engineering construction documents and hydrology studies. Her engineering design experience has consisted of road, site, storm drainage, sanitary sewer, waterline, site grading, earthwork calculations, erosion and sediment control, and detention pond design. Her computer skills include MCACES MII Cost Estimating System, AutoCAD 2005; Land Development Desktop Module; Hydraflow Hydrographs; Hydraflow Storm Sewers; Microsoft Word, Microsoft Excel and Microsoft PowerPoint.

HDR Project Experience

Brookhaven National Labs, National Synchrotron Light Source-II (NSLS-II) Building, Upton, NY. Project Engineer. Mrs. Quiroz is an Asst. project manager and project engineer involved in the civil site design of a new national synchrotron light source building. Her responsibilities included utility design of various utilities including but not limited to steam, chilled water, de-ionized water, and sanitary sewer. Mrs. Quiroz also provided stormwater analysis for the site utilizing NYSDEC regulations and best management practices. Early analysis of the site included determining demolition limits, cost estimation, cut and fill volume calculations and determining preliminary elevations needed to establish a structurally sound base for the highly sensitive light source building. (2007-ongoing)

Dutchess County Resource Recovery Agency, Engineering/Technical Support Services, Dutchess County NY. Project Engineer. Mrs. Quiroz prepared various conceptual site plans for a new materials recovery facility for the Dutchess County Resource Recovery Agency. Conceptual Site design on the project included planning of the facility layout, roadway alignments, grading, preliminary hydraulic analysis of the site, stormwater management design and cost estimation for the proposed and future facilities. HDR has been providing on-going engineering and technical support services to the Dutchess Resource Recovery Agency since 1985. Primary activities include the design of dry lime injection system for test program and managing test program, design of SDA system for acid gas control, ash System Improvements, and general environmental engineering Services. (2006)

Dutchess County Resource Recovery Facility, Engineering Consulting Services, Poughkeepsie, NY. Provided on-going engineering and technical support services to the Dutchess Resource Recovery Agency since 1985. Primary activities include the design of dry lime injection system for test program and managing test program, design of SDA system for acid gas control, ash system improvements, and general environmental engineering services.

Metropolitan Transit Authority, Flood Task Order, Bronx County, NY. Project Engineer. Ms. Quiroz is providing civil engineering assistance in developing a flood review report summarizing recent flooding events for the Metro-North Railroad. This included the following objectives: fieldwork reconnaissance, review of existing hydrologic and hydraulic

models, coordination with NYCDEP for overall assessment and inspection of flood sources, identification and evaluation of specific flood reduction alternatives including construction cost estimation, and formulation of a comprehensive plan for flood reduction improvements. (2007-2009)

Middlesex County, New Brunswick Landing Park Improvement Project, New Brunswick, NJ. Project Engineer. Mrs. Quiroz is providing civil engineering services as a project engineer and assistant project manager for the development of the dock, park, and navigational aids. The project includes a 24 slip floating dock for recreational boats along the Delaware and Raritan Canal Towpath which borders the Raritan River. The dock will provide direct pedestrian access into downtown New Brunswick. Additionally, park improvements will include hardscape features, landscaping, lighting and interpretive signs to be installed from the dock connection on the canal towpath to the New Jersey Department of Transportation (NJDOT) New Street overpass. Ms. Quiroz was also responsible for renewing and revising all permits necessary for the docks, park, and navigational aids. (2009-ongoing)

NYSTA, System-wide Toll Planning Study, Albany, NY. Project Engineer. Mrs. Quiroz assisted in a New York State-wide survey of toll plazas on Interstate 87 and Interstate 90. Mrs. Quiroz was responsible for conducting surveys with toll plaza managers, toll booth collectors and actual roadway customers at the Syracuse, NY toll plaza at Interchange 36 on Interstate 90. The data gathered at this toll plaza interchange was incorporated into a report developed for NYSTA. (2007)

NYSTA, Woodbury Toll Barrier Highway Speed E-ZPass, Orange County, NY. Project Engineer. Mrs. Quiroz provided analysis for stormwater management for redesign of the Woodbury Toll Plaza interchange along Interstate 87 to include E-ZPass thru lanes as well as the modification of the highway system along a 3 mile stretch to allow safe passage and merging of highway speed e-zpass vehicles. Analysis included developing a Stormwater Pollution Prevention Plan in accordance with NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for construction activities as well as conducting hydrologic and hydraulic analysis of the site in accordance with NYSDEC Stormwater Design Manual. Best Management Practices (BMPs) were designed to meet water quality and water quantity requirements outlined by the state and NYSDOT. (2007-2009)

Town of Harrison Dept of Public Works, Proposed Municipal Complex, Town of Harrison, NY, Harrison (Town of), NY. Provided planning and engineering services to the Town/Village of Harrison Department of Public Works (DPW) for the proposed municipal complex to be built on an existing town-owned, 35-acre site (formerly a Nike Missile base).

Town/Village of Harrison, Courthouse and Parking Garage Facilities, Harrison, NY. Project Engineer. Mrs. Quiroz was the civil project engineer for the design and construction of alterations and additions to the (Old) New Haven Railroad Station for conversion into a new courthouse, and a design and construction of a separate parking garage structure with the Town/ Village of Harrison. Mrs. Quiroz was involved in the preliminary and final designs of all aspects of site civil drawings which included site demolition plans, grading plans, utility plans, storm drainage plans, landscape plans, lighting plans, striping/signage plans and an erosion/ sediment plan for the courthouse expansion, new parking garage and the revitalization of the adjacent Emelia Earhart Memorial Park. (2006-2007)

USACE, New York District, USACE-Blind Brook Task Order 5. Project Engineer. Mrs. Quiroz assisted the USACE with the preparation of a comprehensive flood mitigation plan for the Blind Brook Watershed. Primary objectives of this project include: Review of existing hydrologic, hydraulic models of the Blind Brook Watershed; Completion of an overall assessment of flood impacts within the Blind Brook Watershed; Identification and evaluation of specific flood mitigation alternatives for the Blind Brook Watershed; and



Marjorie Nowick

Historical and Archaeological Issues

Overview of Years of Experience

- **27 Years of Experience Performing Similar Work**
- **6 Years with HDR**

Highlights of Professional Qualifications

- Transportation project experience
- HABS Level I, HAER, HALS documentation
- Advisory Council on Historic Preservation
- New York City Landmarks Preservation Commission

Education

- M.Phil., History and Historical Archaeology, New York University
- M.S. Historic Preservation, Columbia University

Registrations and Licenses

- Meets Secretary of the Interior's Professional Qualification Standards, Architectural Historian and Historical Archaeologist

Summary of Capabilities

Ms. Nowick is uniquely qualified as an architectural historian and historical archaeologist who meets the Secretary of the Interior's Professional Qualification Standards, experienced with Section 106 and environmental compliance working for the Advisory Council on Historic Preservations (ACHP), and experienced with the New York City Landmarks Preservation Commission. She has conducted historical research, led and conducted architectural and historical archaeological surveys, evaluated resources for National Register of Historic Places (NRHP) eligibility and prepared NRHP nominations, and developed and conducted architectural and historical archaeological (treatment) mitigation projects. Ms. Nowick is experienced documenting historic resources to Historic American Buildings Survey (HABS)/Historic American Engineering Record (HAER)/Historic American Landscape Survey (HALS) and state requirements. She has worked with architects and engineers to ensure that architectural work meets the Secretary of the Interiors Rehabilitation Standards. Ms. Nowick has worked with many agencies to develop and implement cultural resources management plans and mitigation and treatment plans. Ms. Nowick leads HDR's nine-person Historic Architecture and History Program. The following is a sampling of her experience.

Experience Relevant to the TZHRC Project

- ✓ **Extensive experience with cultural resources/historic preservation compliance including 17 years with the Advisory Council on Historic Preservation**
- ✓ **Industrial structures/bridge experience**
- ✓ **HABS/HAER/HALS documentation**
- ✓ **Interpretation of public interpretation of historic resources**
- ✓ **Local/regional experience**

Project Experience

Grand Coulee Dam, John Keyes Pump-Generating Plant Modernization Program, Columbia River, Washington, Bureau of Reclamation – Project Manager/Co-Architectural Historian (9/2011 - 3/2012). Ms. Nowick was project manager and co-architectural historian to support BOR's compliance with NEPA and the NHPA for this project to modernization the dam's electrical pump-generating plant. Ms. Nowick managed and peer reviewed three NHPA cultural resources studies (archaeological, built resources, and ethnographic) including determinations of effect and mitigation measures and authored the cultural resources



sections of the project NEPA EA. She also authored a Section 106 Memorandum of Agreement (MOA) for NHPA compliance. The modernization project includes equipment upgrades to the 1934/1941 Left Power Plant, Dam, and Keyes Power Plant, siphons and siphon breakers to the irrigation Feeder Canal, and portions of the electrical transmission systems from the dam.

Phase I Research, Six Burlington-Northern Santa Fe Railroad Bridges Over Mississippi and Missouri Rivers, FEMA Security Upgrades (9/2011). Ms. Nowick conducted preliminary research for National Register of Historic Places eligibility evaluation of the Bismarck Bridge, Rulo Bridge, Plattsmouth Bridge, Quincy Bridge, Sibley Bridge, Frisco (Memphis) Bridge. These are six substantial early steel truss bridges built during late 19th century over the Mississippi and Missouri Rivers including several by noted bridge engineer George S. Morison. Bridges were slated for FEMA-funded security upgrades. Included evaluation of effects of FEMA-supported security upgrades.

Greenfield Avenue Bridge Replacement Project, Pittsburgh, Pennsylvania (7/2011). Ms. Nowick conducted research on and evaluated the Greenfield Avenue Bridge, a residential duplex for National Register eligibility. Related, Ms. Nowick evaluated whether bridge is a contributing element of the Schenley Park and its Historic District.

Consolidation of Radiography Shops, Portsmouth Naval Shipyard, New Hampshire, NAVFAC Mid-Atlantic– Cultural Resources Specialist (2010). Ms. Nowick authored the cultural resources sections of a NEPA EA regarding the consolidation of radiography shops at Portsmouth Naval Shipyard, New Hampshire. This included analysis of direct and indirect impacts to a National Register-listed historic district and a National Register-eligible historic district from demolition of several buildings and remodeling of additional facilities.

U.S. Customs and Border Protection/U.S. Army Corps of Engineers, PF225 Tactical Infrastructure Project, Rio Grande Valley, Texas, U.S. Department of Homeland Security – Architectural Historian (2009 – Ongoing). Ms. Nowick is project manager and architectural historian for eight projects to mitigate the adverse effects of the tactical infrastructure project (border fence) on architectural and historic resources in Starr, Hidalgo, and Cameron counties, Texas. Projects include HABS Level I documentation of the James L. Landrum House, a Recorded Texas Historic Landmark; HAER documentation the Los Ebanos Ferry, the last hand-drawn ferry on the border of the continental U.S.; HALS documentation of the Bluffs of the Roma NHL District; HAER documentation of San Benito (Cameron County Irrigation District No. 2); an archaeological baseline study and interpretation and protection plan for Fort Brown earthworks, a NHL; historic study of the NRHP-listed Brulay Plantation; a signage program for the Roma NHL District; a bi-national shared experience heritage tourism interpretive publication/media; and a historic context study of the RGV Rio Grande levee system. This project is a sub-contract of the Galveston District, Army Corps of Engineers.

Radome 4 & Punta Salinas Radar Site, Puerto Rico and U.S. Virgin Islands, Puerto Rico Air National Guard – Project Manager/Architectural Historian (2008 - 2010). Ms. Nowick was project manager and architectural historian for the HABS documentation of Radome 4, Punta Salinas Radar Site including architectural-historical report, large-format photographs, and related documentation of this Cold War-era radome. Ms. Nowick also developed a Section 106 Memorandum of Agreement (MOA) and Integrated Cultural Resources Management Plan (ICRMP) for four Puerto Rico ANG installations. This project was contracted by the National Guard Bureau, Air National Guard Readiness Center.



Overview of Years of Experience

- **13 Years of Experience Performing Similar Work**
- **10 Years with HDR**

Highlights of Professional Qualifications

- Field Sampling & Compliance Monitoring management
- Environmental Management and Construction Plan development
- Essential Fish Habitat studies
- State & Federal Permitting experience

Education

- Master of Science, Environmental Sciences/Studies, State University of NY Stony Brook
- Bachelor of Science, Biology, Mary Washington College

Summary of Capabilities

Ms. Zappala is a Project Manager in HDR's Natural Resource Management and Permitting Group. She specializes in designing field and laboratory programs to evaluate project related impacts to the aquatic environment. She has developed and led the compliance monitoring program associated with in-water construction projects. Ms. Zappala has led U.S. Army Corps of Engineers navigation improvement projects, HVDC Submarine Cable feasibility and siting projects as well as other private and public sector sponsored waterfront and aquatic-related projects. She is responsible for preparing environmental reviews, state and federal permits and impact statements for waterfront development projects by evaluating project impacts on fish, threatened endangered species and benthic species. Many of these studies have included field sampling to document physical, chemical, and biological conditions at the project sites.

Experience Relevant to the TZHRC Project

- ✓ **Led Aquatic Monitoring Compliance Program for in-water construction projects within Hudson River and NY/NJ Harbor**
- ✓ **Developed Water Quality/TSS monitoring program for dredging projects**
- ✓ **Negotiated pre and post-installation/construction sampling plans**
- ✓ **Coordinated compliance monitoring plans with Federal and State regulatory agencies**

Project Experience

Champlain Hudson Power Express, Hudson River, New York, Transmission Developers Inc. – Aquatic Task Lead (2008 – Ongoing). Ms. Zappala was responsible for conducting the pre-feasibility study for a proposed HVDC underwater and underground transmission cable that will bring wind and hydro power from the US-Canada border to the New York Metropolitan area. She led the evaluation of potential impacts to aquatic resources, navigation, commercial fisheries, sediments and contaminants. Ms. Zappala also identified potential corridors and routes for the proposed cable route. As part of the permitting team, Ms. Zappala coordinated with the following state and federal agencies; New York State Public Service Commission (NYSPSC), New York State Department of Environmental Conservation (NYSDEC), New York State Canal Corporation (NYSCC), New York State Department of State (NYSDOS), U.S. Army Corps of Engineers (USACE), U.S.



Environmental Protection Agency (USEPA), New York Power Authority (NYPA), Consolidated Edison (Con Ed), U.S. Coast Guard (USCG) and Connecticut Department of Environmental Protection (CTDEP). In addition, Ms. Zappala is part of the State and Federal permitting team preparing Article VII and USACE permit applications, she developed and negotiated pre- and post- installation compliance monitoring studies including, benthic recovery, Water Quality and TSS monitoring and Atlantic Sturgeon hydroacoustic study.

Hudson Transmission Project, Hudson River, New York/New Jersey, Prysmian Power Cables and Systems – Technical Lead (2011 – Ongoing). The Hudson Transmission Project is a 6 mile long 345 kV HVAC transmission line connecting the Bergen Substation in Ridgefield, New Jersey to Con Ed's West 49th Street Substation in New York City. The submarine cable portion extends for approximately 4 miles and was installed in the Hudson River. Ms. Zappala was responsible for QA/QC of the upland Environmental Management and Construction Plan (EM&CP) and agency coordination including NYSDEC and NYSDPS. In addition she led the development of the submarine cable EM&CP as well as the development of the sediment and benthic compliance plans and monitoring programs.

Harbor Deepening Biological Monitoring Program, New York/New Jersey Harbor, USACE New York District – Program Manager (2002 – 2010). Ms. Zappala led the HDR team that assisted the USACE in the annual aquatic biological sampling program in New York and New Jersey Harbor to assess potential impacts of navigation channel improvements. The program's primary goal is to characterize the fish, shellfish, and macroinvertebrate distribution patterns, community structure, and seasonal patterns of habitat use, as well as water quality, in the Estuary. The program has involved a variety of gear-types to sample shoal, berthing areas and channel habitat in Newark Bay, Arthur Kill, Kill Van Kull, Upper New York Bay, and Lower New York Bay, including otter trawls, crab dredges, epibenthic sled-mounted plankton nets and sediment grabs. Recent efforts have focused on collecting juvenile (eggs and larvae) and adult winter flounder between December and June to determine the utilization and significance of Harbor habitat designated as essential fish habitat for early life stages and to determine spawning areas and periodicity by analyzing the sex ratio of winter flounder adults. Ms. Zappala's responsibilities also include identifying fish larvae and eggs and benthos.

Neptune Regional Transmission System, Hempstead, New York/Sayreville, New Jersey, Prysmian Cables and Systems – Project Biologist (2001 – 2007). Ms. Zappala was the Project Biologist responsible for developing and coordinating benthic macroinvertebrate, shellfish and fisheries sampling plans in order to determine the possible impacts to these communities from the submarine cable installation. Ms. Zappala was also responsible for preparing the EM&CP associated with the upland and submarine cable routes. Ms. Zappala helped to identify potential impacts of cable installation along the alternative cable routes and proposed cable installation methods to avoid or minimize impacts to significant coastal fish and wildlife habitats, commercial and recreational fish and shellfish resources, and short and long-term channel improvement projects. HDR also coordinated meetings with state and federal resource agencies, including the New York Public Service Commission, New York State Department of Environmental Conservation (NYSDEC), National Marine Fisheries Service (NMFS) and the U.S. Army Corps of Engineers (USACE).

Appendix C:

Environmental Performance Commitments

Table C.1 - Summary of Environmental Performance Commitments (EPC's)¹

Environmental Resource Area	Environmental Performance Commitment
Transportation	<p>Implement and follow a Work Zone Traffic Control (WZTC) Management Plan, following a strict schedule; minimizing detours through residential areas; use Intelligent Transportation System measures, such as variable message signs, and notify the local news of road closures, detours, and other WZTC activities.</p> <p>Project sponsors would coordinate with local agencies regarding the hauling of any construction materials to identify acceptable routes, roadways, and times.</p> <p>The contractor would coordinate with potentially affected public services in planning traffic control measures. Access to all businesses and residences would be maintained.</p> <p>The ability for boats to travel along the Hudson River would be maintained throughout the construction period. Signage and markers would be utilized (in coordination with the USCG) to advise recreational boaters of preferred routes and/or dangers.</p>
Community Character	<p>A construction contract stipulating that the contractor must maintain a clean and orderly worksite, with metrics included for determining compliance, provisions for enforcement, and penalties for non-compliance, would be developed to minimize potential impacts on community character during construction.</p>
Land Acquisition, Displacement, and Relocation	<p>The site owner would be compensated for the easement. The parking spaces within the permanent easement area at Bradford Mews Apartments may be relocated on-site at the discretion and responsibility of the owner.</p>
Parklands and Recreational Resources	<p>No direct disturbance to parks is proposed. See "Air Quality" and "Noise" below for EPCs which would minimize any potential impacts to nearby parks during construction.</p>
Historic and Cultural Resources	<p>Measures to avoid or minimize impacts to historic and cultural resources during construction are outlined in the executed Memorandum of Agreement.</p> <p>As stipulated in the executed MOA, a Construction Protection Plan will be implemented by the Project's contractors to avoid inadvertent damage to historic properties as a result of construction activities.</p>

Air Quality	<p>In order to avoid or minimize potential air quality impacts, the following measures, practices, and EPCs would be used or implemented during construction</p> <ul style="list-style-type: none"> - Clean Fuel: All diesel fuel would be ultra-low sulfur diesel. - Best Available Tailpipe Reduction Technologies: All land-based diesel nonroad engines (excluding marine engines) rated at 50 horsepower or greater would be fitted with diesel particle filters. - Utilization of Newer Equipment: All non-road construction equipment (excluding marine engines) in the project rated at 50 horsepower or more would meet USEPA Tier 3 emissions standards or better (smaller engines would be Tier 2 certified—the cleanest rating for that size engine). - Tug Boat Emissions Reduction: The total combined PM emission rate from all tug boats used for the project would be limited to 3,700 grams per hour at peak power, including auxiliary engine emissions. This limit may be achieved by installing retrofits, using new engines, repowering or engine replacement, or various combinations of these measures, along with limitations on the engine size and number of tug boats on site. - Concrete Batch Plant Controls: If an on-site concrete batch plant is used, the concrete batch plant would vent the cement weigh hopper, gathering hopper, and mix loading operations to a baghouse or filter sock. Storage silo chutes would be vented to a baghouse. Roadways at the concrete batch plant, and all unloading and loading material handling operations, would have a dust control plan providing at least a 50 percent reduction in PM10 and PM2.5 emissions from fugitive dust through wet suppression. - All reasonable efforts would be made to address heavy duty vehicle idling at the project site in order to reduce fuel usage (and associated costs) and emissions. On-road diesel fueled trucks may not idle for more than five consecutive minutes except under certain specific conditions. In addition to enforcing the on-road idling prohibition, all reasonable efforts will be made to reduce non-productive idling of non-road diesel powered equipment. - The contractor will be required to implement a strict fugitive dust control plan. - A real-time air quality monitoring program will be implemented to ensure contractor compliance with the emissions control plan.
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Noise	<p>In order to minimize or avoid potential noise impacts during construction, the following measures or practices would be implemented:</p> <ul style="list-style-type: none"> - As practicable, noise abatement measures would include shrouds to reduce pile driver noise, quiet compressors and generators, and use of portable or other noise barriers and/or enclosures. - As practicable, electric powered equipment rather than diesel would be utilized. - Use of impact devices such as jackhammer, pavement breakers, and pneumatic tools would be limited and shrouds would be utilized. - Construction staging areas would have appropriate noise attenuation installed. - Contractors and subcontractors would be required to properly maintain equipment. - Attenuating curtains or shrouds would be used on pile drivers when in close proximity to residential areas. - Moveable noise attenuation measures would be erected around pumps, trucks, etc. when close to residential areas. - Nighttime, Saturday morning, and Sunday activities will be limited to 70dBA Lmax at 50 feet. - Temporary noise barriers would be installed along truck access routes and shoreline work platforms. - A noise and vibration monitoring program would be conducted to document contractor compliance with allowable emission levels.
Energy and Climate Change	<p>Construction contracts would, as practicable, require several measures during construction: the use of supplementary cementitious materials (SCM); reducing concrete waste; and optimize cement content. In addition, the following measures would be implemented, where practicable: the use of biodiesel fuel, the use of recycled steel, and the use of local materials sourcing.</p>
Topography, Geology, and Soils	<p>An erosion and sediment control plan, developed as part of a Stormwater Pollution Prevention Plan (SWPPP) for the project, would be implemented to minimize soil erosion and sedimentation of surrounding waterways.</p>

Water Resources / Ecology	<p>The following measures and EPCs would be implemented to minimize or avoid potential adverse water quality impacts during construction:</p> <ul style="list-style-type: none"> - A SWPPP would be developed pursuant to a State Pollution Discharge Elimination System (SPDES) General Permit (GP-0-10-001) to avoid adverse impacts to water quality. Further, activities within any floodplains, and dredging and disposal of dredge material would comply with all applicable federal and state legislation and regulatory programs. - Existing Bridge Demolition: No blasting would occur; columns and footings cut with diamond wire or broken by pneumatic hammers, timber piles will be cut off 2 feet below the mudline; materials not re-used or recycled would be transported to an appropriate, permitted off-site disposal facility; turbidity curtains will be used as required during removal of columns, footings, pile caps and piles, including timber piles. All debris shall be prevented from falling into or otherwise being deposited into the river during demolition. Regularly scheduled side-scan sonar surveys shall be performed for verification. - EPCs to be employed during construction of the substructure include: Driving the largest piles within the first few months of the project; using cofferdams and silt curtains, where feasible, to minimize discharge of sediment into the river; using a vibratory pile driver to the extent feasible; using bubble curtain or other technologies to achieve a reduction of at least 10 dB of noise attenuation during pile driving; limiting the periods of pile driving to no more than 12-hours/day; limiting driving of 8 and 10 ft. piles with an impact hammer within water depths 18-45 feet to 5 hours per day during the period of spawning migration for shortnose and Atlantic sturgeon (April 1 to August 1); maintaining an acoustic corridor where the sound level will be below an SELcum of 187 dB re 1 μPa2s totaling at least 5,000 ft at all times; pile tapping to cause fish to move from the immediate area. - In addition, development of a comprehensive monitoring plan would include: noise monitoring to characterize the hydroacoustic field surrounding pile-driving operations; monitoring water quality parameters such as suspended sediment concentrations in the vicinity of the pile driving; monitoring fish mortality and inspection of fish; monitoring the recovery of the benthic community within the dredged area at the end of the construction period; supporting the Atlantic and shortnose sturgeon sonic tagging program; monitoring predation levels by gulls and other piscivorous birds; developing criteria for re-initiating consultation with NMFS should specific numbers of shortnose or Atlantic sturgeon come to the surface injured or dead. - Dredging operations would be conducted using a clamshell dredge with an environmental bucket and no barge overflow. Dredging operations would only be conducted during a three-month period from August 1 to November 1; NMFS-approved inspectors would oversee the dredging operations; Armoring of the channel would be undertaken to prevent re-suspension of sediment during the movement of construction vessels, installation and removal of cofferdams, and pile driving.
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Hazardous Materials	A Phase II subsurface investigation was performed in areas of potential soil disturbance. A site-specific Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) would be developed based on results of the Phase II to outline appropriate handling and disposal methods of any identified hazards or contaminated materials. If additional areas of subsurface disturbance are identified prior construction, Phase II Subsurface Investigations will be performed in these areas and the RAP and CHASP updated accordingly.
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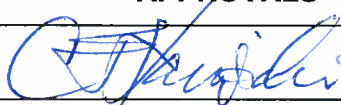
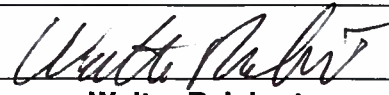
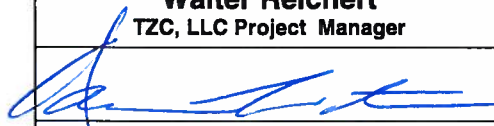
¹ Table C.1 is based on Table 4: Summary of Environmental Performance Commitments (EPCs) of the Tappan Zee Hudson River Crossing Project: Joint Record of Decision and State Environmental Quality Review Act Findings Statement.



QUALITY PLAN

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EFFECTIVE DATE: April 12, 2013

REVISION NO.	DESCRIPTION	APPROVALS	DATE
0	Initial issue 02/19/13		4/12/13
1	NYSTA comments (R1 for design sections only) 04/12/13	Charles J. Kanapicki TZC, LLC Quality Manager	04/12/13
			4/16/13
		Walter Reichert TZC, LLC Project Manager	04/12/13
			4/16/13
		Darrell Waters TZC, LLC Project Executive	04/12/13



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	Table of Contents / Date Revision Page	April 12, 2013
	Foreword	April 12, 2013
1	Organization and Responsibilities	April 12, 2013
1.1	Continuous Improvement/Client Satisfaction	April 12, 2013
2	Manual Preparation and Maintenance	April 12, 2013
3	Design Control	April 12, 2013
4	Document Control	Not Included*
5	Purchasing	Not Included*
5.1	Subcontractor Qualification	Not Included*
5.2	Field Receiving and Inspection	Not Included*
5.3	Material and Equipment Storage and Maintenance	Not Included*
6	Product Identification and Traceability	Not Included*
7	Process Control	Not Included*
8	Activity Plan for Construction	Not Included*
8.1	Inspection and Testing	Not Included*
9	Monitoring and Measuring Equipment	Not Included*
10	Inspection and test Status	Not Included*
11	Control of Nonconformances	April 12, 2013
12	Corrective Action	April 12, 2013
12.1	Preventive Action	April 12, 2013
13	Quality Records	April 12, 2013
14	Quality Audits	April 12, 2013
15	Personnel Training and Qualification	April 12, 2013

*Per agreement with NYSTA, this Revision 1 issue of the TZC, LLC Quality Plan will only address design related activities. The construction portions of this Quality Plan are being developed and will be included in a Revision 2 issue.



FOREWORD

The Tappan Zee Constructors LLC (TZC, LLC) Quality Plan is based on ISO 9001:2008 requirements, and the New York State Thruway Authority Tappan Zee Hudson River Crossing Project Design-Build Project, DB Contract Documents Part 2, sections 113, 111 and 112. The Quality Plan describes the quality organization, management approaches, systems, and processes TZC will use to manage and deliver the Tappan Zee Hudson River Crossing Project, meeting all design, procurement, construction, testing and commissioning contractual requirements, and applicable regulations and laws.

ORGANIZATIONAL APPROACH

TZC, LLC Project Executive through the Quality Manager (QM) will manage the overall quality program on the Tappan Zee Hudson River Crossing Project (TZHRC). The QM is responsible for the development of this project-wide Quality Plan that establishes TZC, LLC quality policies and procedures for temporary and permanent works. These policies and procedures are intended to serve as high-level project requirements, but are designed to allow the incorporation of stand alone engineering subconsultant and fabricator/subcontractor quality plans provided they are contractually compliant and compatible with this Quality Plan.

Independent Quality Assurance Engineering Firm

TZC, LLC will retain the services of an independent Quality Assurance Engineering (QAE) Firm, Greenman – Pedersen Inc., reporting to the Quality Manager, that will perform the contractually required design and construction (on and off-site) quality assurance functions. The QAE contractually compliant design and construction quality assurance plans (DQAP and CQAP) will be incorporated into this Quality Plan.

Design

Design quality control will be performed by the individual design firms retained by TZC, LLC, the primary firm being HDR. These design firm contractually compliant quality control plans will be incorporated into this Quality Plan. For those design services performed by TZC, LLC staff the design quality control procedures included in this Quality Plan.

Construction

Quality control for on and off-site TZC, LLC self-perform work will be performed primarily by a construction quality control firm, The LiRo Group, and augmented by TZC, LLC field staff. Construction QC for off-site work performed by others will be performed by their in-house QC function (e.g., AISC certified fabricators; PCI certified pre cast plants, etc.). TZC, LLC will review off-site construction QC plans to ensure that these subcontractors/fabricators meet both QC/QA and Contract requirements.



SECTION 1 – ORGANIZATION AND RESPONSIBILITIES

Purpose

The TZC, LLC Organization and Management Responsibility policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 111, 112 and 113 and specifically DB 113-3.1.1 Quality System Procedures, Part A and AA, DB 113-1.4 Organizational Requirements and DB 113-2 Management responsibility.

Scope

TZC, LLC primary goal is providing NYSTA with design and construction services as defined in our contract. These require TZC, LLC to define and document a quality policy, and communicate, implement, and maintain that policy at all levels of its organization. They also require that TZC, LLC:

- Designate a representative with defined authority and responsibility for ensuring that the TZC, LLC quality policy is implemented and maintained, and
- Identify those persons responsible for the quality assurance and quality control functions and define in writing the responsibility, authority, and interrelation of those persons.

TZC, LLC management accepts this responsibility and commits the resources required to do so. The following paragraphs describe TZC, LLC management's:

- Quality policy;
- Management roles and responsibilities including interface with NYSTA;
- Quality goals and objectives;
- Management review; and
- Management responsibility quality records.

Quality Policy

To assure NYSTA that TZC, LLC performs its design and construction activities in compliance with NYSTA DB Section 111, 112, and 113, TZC, LLC developed, implemented and maintains the Quality Plan documented in this manual, and establishes the following as our prime Quality Policy:

The TZC, LLC Team's technical activities will comply with the requirements established in the TZC, LLC Quality Plan.

In order to achieve the goal of TZC, LLC prime Quality Policy, TZC, LLC management further establishes the following:

TZC, LLC management will commit the resources necessary to make sure the requirements established in the TZC, LLC Quality Plan are understood, accepted, and fully implemented by the TZC, LLC Team.



Management Roles and Responsibilities

Project Executive (Key Personnel)

The TZC, LLC Project Executive, reporting to the TZC, LLC joint venture partners, is responsible for the administration, implementation, maintenance and evaluation of TZC, LLC Quality Plan.

Quality Management

Quality Manager (Key Personnel)

Assigned full time to the Project, reporting directly to the TZC, LLC Project Executive, and working closely with the NYSTA Quality Manager, the TZC, LLC Quality Manager is responsible for overall management of the quality organization, development of the Quality Management Plan, and verification that the Quality Program is fully implemented and effectively executed.

The TZC, LLC QM has the authority to stop affected work, control further processing, or prevent the shipment of items that do not meet contract requirements. A Stop Work Order written by the TZC, LLC QM can be removed only by the TZC, LLC QM. The NYSTA will be notified when a Stop Work Order is issued and when it is removed.

The TZC, LLC QM will provide input on QA and QC design and construction issues or problems with particular emphasis on items that may require revision to the approved QMP. These issues may include changes in the QA and QC organizations and personnel and/or changes in approved procedures. The TZC, LLC QM will submit a QA/QC report at the Monthly Progress Report and Meeting. An annual review will be performed on all Quality Programs (Construction, Design and Project). The TZC, LLC QM will collect and review all quality input from the NYSTA and from internal audits, corrective actions, etc., and will propose revisions to the Quality Manuals. The annual revision will be reviewed by upper management and approved by the NYSTA prior to implementation. At times during the Project, the manuals may be revised more frequently due to requests from the NYSTA or requests for project corrective action.

The TZC, LLC QM is responsible for managing the Design Quality Assurance Manager (DQAM), and Construction Quality Assurance Manager (CQAM). The QM interfaces on a regular basis with the:

- The TZC, LLC Project Executive
- NYSTA on audits, reviews, and inspections, and test results
- DQAM and CQAM on overall QA/QC issues including staffing requirements, audits, reviews, and inspection and test results
- DQAM on design reviews, changes, audits, technical working groups, and constructability reviews
- TZC, LLC Project Manager and the construction leadership team on staffing and scheduling requirements and on audits, reviews, inspection and test results, and hold points
- QA and QC representatives of subcontractors and suppliers

And, in keeping with TZHRC DB Contract Documents Section 113 – Design-Builders Quality Plan; “The (Tappan Zee Constructors) Quality Manager shall be present and available for



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consultation with the Authority's Project Manager and other NYSTA staff on an on-call basis throughout the duration of the Project."

The QM is not assigned duties other than those directly related to quality.

Design QA Manager (DQAM)

The Design QA Manager shall be an employee of the independent Quality Assurance Engineering Firm (QAEF) and shall have no responsibilities in the production of the design work. The Design QA Manager will report directly to Tappan Zee Constructors' Quality Manager and is responsible for all QA of all work conducted by the Designer. He is the Manager in responsible charge of the QAEF organization's programs. The Design QA Manager shall be a New York-licensed professional engineer. Design QA Manager shall be responsible for coordinating the schedule of Design QA activities with Tappan Zee Constructor's design activities. The Design QA Manager shall assess and evaluate the Tappan Zee Constructor's design QC activities to be able to certify to Tappan Zee Constructors and to the NYSTA that the design QC activities comply with the Quality Plan and Contract Requirements. The NYSTA Design Compliance Engineer shall have direct access and will coordinate with the Design QA Manager .

For a more detailed description of the DQAM roles and responsibilities please see the Design Control section of this Quality Plan.

Construction Quality Assurance Manager (CQAM)

The construction QA manager is the manager in responsible charge of the QAEF organization's programs. The Construction QA Manager shall be a New York-licensed professional engineer with experience on similar projects as the construction manager. The Construction QA Manager will report directly to the Design-Builder's Quality Manager. The Construction QA Manager or his/her designees, shall be delegated the authority to make needed improvements to the quality of Work including the authority and obligation to suspend work if required

The Construction QA Manager shall be responsible for coordinating the schedules of Construction QA Inspectors with the Design-Builder's quality control and construction Activities. The NYSTA Construction Compliance Engineer shall have direct access and will coordinate with the Construction QA Manager the. On a monthly basis the Construction QA Manager will certify, that among other things, the Quality Plan and all measures and procedures provided therein are functioning properly and are being followed except as specifically noted in the certification. At the completion of the Project, the Construction QA Manager will sign the certificate of compliance indicating that all materials incorporated in the Project conform to the Contract requirements.

For a more detailed description of the CQAM roles and responsibilities please see the Inspection and Testing section of this Quality Plan.



Design Quality Control Manager (DQCM)

The DQCM will report to the Design Manager and TZ Constructor's QM. The DQCM is responsible for developing and maintaining a design Quality Management System to achieve compliance with the Quality Goals and train the design personnel in the Design Control Procedures (DCPRs). The DQCM, and staff, will have no responsibilities for or involvement in the production of the work. The DQCM will also monitor, facilitate, and verify subconsultant compliance with the DQMP. The Design Quality Control Manager and all Design Quality Control and Design Quality Assurance staff shall have the authority to stop Work that does not comply with requirements of the Contract Documents.

For a more detailed description of the DQCM roles and responsibilities please see the Design Control section of this Quality Plan.

Construction Quality Control Manager (CQCM)

The construction QC manager is the manager in responsible charge of the Construction QC organization's activities and is ultimately responsible for overall management, coordination, supervision, performance and documentation of all construction quality control activities. The construction QC manager is a licensed professional engineer in the State of New York.

The construction QC manager has the authority to make modifications to the construction quality program and has the authority and obligation to stop work. The construction QC manager shall report any quality issues that cannot be resolved at the project management level to the project quality manager, who shall determine the necessary action to ensure resolution of the issue.

For a more detailed description of the CQAM roles and responsibilities please see the Inspection and Testing section of this Quality Plan.

QA/QC Organization Interface with the NYSTA

NYSTA Oversight will be referenced in and coordinated in this TZC, LLC Quality Plan. An organization chart or matrix will be developed (to be included in a later revision of this manual) showing each team member's work responsibilities, their reporting relationships within TZC, LLC, and their interrelationships with other TZC, LLC and the Agency's project team members, and their Design and Construction Compliance Engineers.

The Design Team will use a Cross Discipline review of the design to identify conflicts and assure the design is compatible across the various disciplines. A Constructability Review will be used to gain input from the Contractor regarding constructability and installation. Over the Shoulder (OTS) and Technical Work Group (TWG) meetings will be used to achieve real-time input from the NYSTA, stakeholders, the design team, and construction personnel.

TZC, LLC will notify and invite the NYSTA to participate in all design reviews conducted by the Design QA Manager. The NYSTA may also invite Project Stakeholders and affected utility owners to participate. The NYSTA will provide consultation and written comment regarding these Design Reviews.

In addition, the NYSTA will participate as follows:



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- Review and approve the TZC, LLC Quality Plan and its revisions;
- Attend weekly construction coordination meetings;
- TZC, LLC will coordinate and facilitate the NYSTA oversight verification testing and inspection activities;
- Conditions adverse to quality discovered by TZC, LLC will be documented and reported in writing to the NYSTA;
- TZC, LLC testing and inspection activity documents will be communicated and distributed to the NYSTA;
- TZC, LLC will report the proposed disposition of nonconforming product to the NYSTA for their consent; and
- TZC, LLC will make available all quality records for the NYSTA oversight and verification procedures.

Management Staff Interrelationships

The TZC, LLC staff supporting the PM is shown on the TZC, LLC Organization Chart (Figure 1-1). This chart shows each team member's work responsibilities, their reporting relationships within TZC, LLC.

Quality Goals and Objectives

To meet the requirements stated in TZC, LLC prime Quality Policy, TZC, LLC establishes these project quality goals focused on TZC, LLC interactions with NYSTA:

- Develop, implement, and maintain an effective and NYSTA compliant/approved Quality Management System;
- Support and implement quality assurance initiatives; and
- Communicate and coordinate with NYSTA Quality Manager, and NYSTA Design and Construction Compliance Engineers.

Management Review

The Project Executive, PM, and other personnel, will review the effectiveness of the Quality Plan at least annually. Based on this review, the Project Executive will, if deemed necessary, recommend adjustments to the Quality Plan for NYSTA review and approval. Resources for continued implementation and maintenance of the Quality Plan are then determined and committed as appropriate.

TZC, LLC annual review of the Quality Plan will include, but not be limited to the following:

- Results of TZC, LLC internal QA audits;
- Results of NYSTA oversight audits on TZC, LLC Quality Plan implementation;
- Feedback from TZC, LLC management team;
- Feedback from NYSTA oversight staff, including FHWA and other stakeholder feedback via NYSTA;
- Activities scheduled for the upcoming year that may require special QA processes or procedures; and
- The introduction of new client, third party or industry requirements.

These management reviews will be documented in the form of meeting minutes and then retained by TZC, LLC Document Control as a Quality Record.



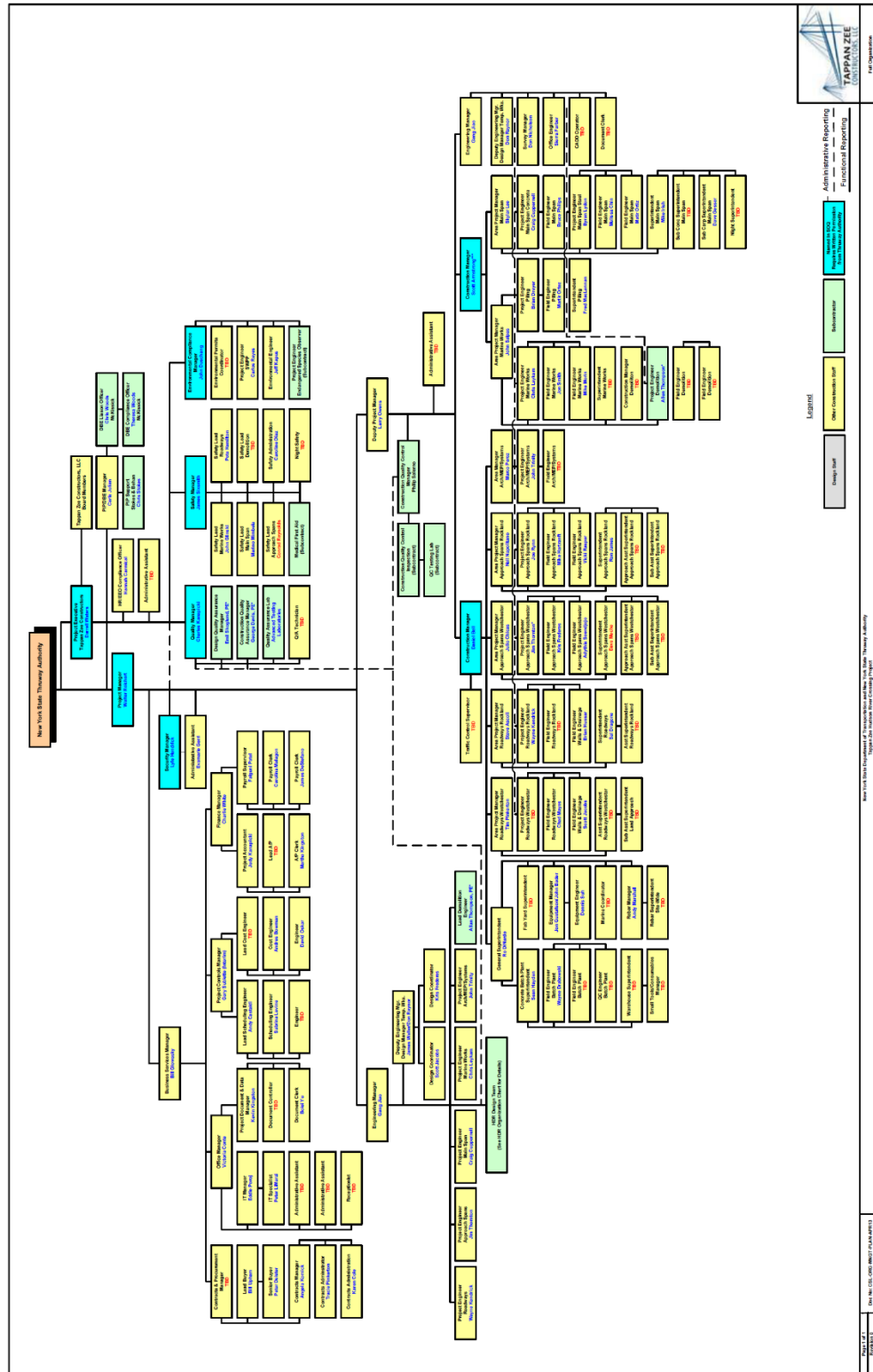
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Management Responsibility Quality Records

TZC, LLC Management Responsibility quality records will be produced, maintained and controlled in accordance with the provisions of the Document Control, and Quality Records sections of this Quality Plan.

FIGURE 1-1
TZC, LLC Organization Chart (uncontrolled version)





SECTION 1.1 – CONTINUOUS IMPROVEMENT/CLIENT SATISFACTION

Purpose and Scope

Continuous Improvement

To continuously improve performance while meeting schedule milestones and controlling costs, TZC, LLC will establish a quality culture known as Value Creation. This Section is also developed to comply with NYSTA DB Section 113-3.12.1 Continual Improvement.

Client Satisfaction

ISO 9001:2008 indicates that achieving quality requires a NYSTA focus, and states in part, “Organizations depend on their clients, and therefore should understand current and future client needs, should meet client requirements and strive to exceed client expectations.” This Section is also developed to comply with NYSTA DB Section 113-2.2 Customer Focus.

Policies and Responsibilities

The Quality organization will help implement the Value Creation and Client Satisfaction programs as agreed with the Project Executive and the NYSTA. The following work processes are used to ensure successful implementation of the program and to continuously improve TZC, LLC ability to execute projects with excellence:

Continuous Improvement Activities

Continuous improvement through Value Creation challenges the project team members to create unique and outstanding value for TZC, LLC and NYSTA through these Value Creation processes:

- **Alignment Process** – A process that facilitates agreement between NYSTA and the TZC, LLC project team on project objectives and strategy, and the roles and responsibilities of team members. Alignment sessions are held throughout the project life cycle, whenever there is a need to discuss key execution issues, improve performance, or align team members in specialized areas. Key Result Areas (KRAs) are developed early in the alignment process to identify measurable goals in performance areas that are top priorities for NYSTA. These goals are linked to a specific plan for recognizing and rewarding excellent performance.
- **Value Awareness Process** – Value Awareness is a process that is implemented on a project to capture and document Value Creation ideas and successes. It allows all the task force personnel (including NYSTA) to submit suggestions for lowering or avoiding costs on the project. The Value Awareness process can include a recognition and reward program, work process improvement (WPI) teams, and total employee involvement activities.
- **Value Improvement Process** – Value Improvement is a process that utilizes Value Improving Practice (VIPs), which are a set of structured, out of the ordinary practices that can be applied to add value by improving cost, schedule and/or reliability outcomes of capital construction projects. The VIP process is formal and structured, and is kicked off with a VIP Selection Workshop. The outcome is documented such that the results of various VIP's can be utilized by various stakeholders during project execution. Alignment and Value Awareness are both key VIPs that are used on the TZHRC Project as



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indicated above. Value Engineering is another key VIP that is used on many TZC, LLC projects.

- **Assessment Process** – Assessments of project readiness are normally performed to confirm that projects are ready to move from one project phase to another. These assessments can be performed by independent consultants or by an internal TZC, LLC teams.

Client Satisfaction Activities

NYSTA satisfaction process provides a means of responding to NYSTA needs, desires, and perceptions, and provides guidance on the effective handling of NYSTA complaints. Any member of the project team may be called upon to address NYSTA satisfaction issues. To provide NYSTA Satisfaction a relationship management and measurement system will be designed to involve TZC, LLC employees and the NYSTA in a continuous process of performance improvement. This includes implementation of a NYSTA Review Process.

Obtaining and Assessing NYSTA Feedback – NYSTA Review Process is used to hold structured interviews with NYSTA. This process helps to understand how to proactively manage relationships with NYSTA, to determine whether TZC, LLC is meeting NYSTA needs, and to continuously improve performance on projects. NYSTA feedback during all project phases is very important to the improvement process.

The feedback helps Project and Office Management to:

- Document the value TZC, LLC adds
- Identify opportunities for improvement
- Recognize what TZC, LLC does well
- Obtain information that will help drive Value Creation

Managing NYSTA Concerns / Complaints a NYSTA complaint is a significant, documented concern on the part of NYSTA during the execution of a project about the quality, safety, performance, or reliability or the way in which the project is being executed.

To promote NYSTA satisfaction, TZC, LLC will set up an interface with NYSTA which includes meetings, discussions, design reviews, etc. The Project Executive is responsible for monitoring NYSTA satisfaction and responding to concerns or complaints, and the Quality Manager supports this effort as requested.

Fortunately, most NYSTA comments identified through normal business interactions can be documented in project administrative communications (letters, conference notes, action item lists, etc.), and do not have to be treated as formal NYSTA complaints.

However, the following steps and flowchart summarize the activities to be followed by TZC, LLC personnel when concerns or complaints do arise.

This procedure explains how TZC, LLC will identify, collect, document, and resolve significant concerns and NYSTA complaints for the projects they execute.

1. The Project Executive designates a person who will act as the focal point for managing NYSTA concerns / complaints. Typically, this person is the TZC, LLC Quality Manager.



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2. The TZC, LLC Quality Manager creates a NYSTA Concern / Complaint Log form which must include the following information for each complaint, at a minimum:
 - Concern / Complaint Documentation Date
 - Source / NYSTA
 - Description of Concern / Complaint
 - Root Cause (if required)
 - Action Required
 - Responsible Person
 - Concern / Complaint Closure Date
3. TZC, LLC team members identify NYSTA concerns / complaints through any of the following means, and then send copies of these documents to the TZC, LLC Quality Manager:
 - Letter, memo, conference note, or other project-level communication
 - Written Sales or Marketing contact information
 - Telephone or other conversation documented in a record of conversation
 - E-mail message
4. The TZC, LLC Quality Manager records the NYSTA concerns / complaints in the log, and then at the end of each month, sends a copy of the log to the TZC, LLC Managers of all affected areas.
5. The TZC, LLC Quality Manager reports on NYSTA concerns / complaints at the monthly Project Status Review (PSR) meeting.
6. The Office TZC, LLC Quality Manager investigates the concerns / complaints to determine whether corrective actions are required, and documents this information. In rare cases, root cause analysis is deemed necessary.
7. The TZC, LLC Quality Manager ensures that the corrective actions are initiated, and then ensures they are completed.
8. The TZC, LLC Quality Manager schedules an analysis of NYSTA concerns / complaints and corrective actions as a topic for discussion at the Management Review Meeting.



SECTION 2 – MANUAL PREPARATION AND MAINTENANCE

Purpose

The TZC, LLC Quality Plan along with its policies, procedures and guidelines are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.1.1 Quality System Procedures, Part A and DB 113-3.1.2 Quality Planning.

Revisions to this manual are controlled in accordance with the Document Control section of this manual. The TZC, LLC team will use the most current version of the TZC, LLC Quality Plan. If the user has any questions concerning the revision status of the TZC, LLC Quality Plan and its policies and procedures, immediately notify the appropriate supervisory personnel and the TZC, LLC Quality Manager for guidance and instruction.

Scope

The TZC, LLC Quality Plan describes an integrated system of policies, procedures, and guidelines developed to comply with NYSTA DB Section 113 Design-Builders Quality Plan and to ensure that TZC, LLC internal project quality goals and objectives are satisfied. This requirement extends to TZC, LLC design sub-consultants, service providers and construction subcontractors. This Quality Plan is also designed to be a system that, in a controlled manner, allows for new or modified policies and procedures.

The TZC, LLC Quality Plan will follow an organization and format that allows a ready means for cross-referencing between this Quality Plan and NYSTA DB Section 113 Design-Builders Quality Plan (see Tables 1, 2 & 3).

Policy

Activities affecting quality shall be governed by contract documents and shall:

- Be in conformance with approved procedures, instructions, drawings, specifications, or other means of prescribed inspection/testing procedures, including a written work plan; and
- Include appropriate quantitative and/or qualitative acceptance criteria for determining that engineering/design, construction management, inspection, and testing activities are in conformance with Contract criteria.
- The initial issue and revisions to the Quality shall be in accordance with the following:
 - The Table of Contents shall show the revision date of each revised procedure and shall be reissued for each revision.
 - Revision dates for all pages of all procedures in the Quality Plan shall match the dates in the Table of Contents.
 - The Quality Manager, Project Manager, and Project Executive should approve each revision by signing the Approval Page.
 - NYSTA shall also review and approve the initial issue and revisions to the Quality Plan. Once approved, forward the approved revision and affected documents to Document Control for maintenance and distribution to all Quality Plan holders.

Responsibility

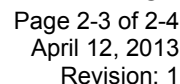
The Project Executive is responsible for ensuring that:

- TZC, LLC Quality Plan's policies and procedures are established and implemented; and

- The provisions of this Quality Plan are provided to the appropriate TZC, LLC sub-consultants through the technical provisions of sub-consultant's contract.
- TZC, LLC key personnel (see the Organization and Responsibility section of this Quality Plan) are responsible for supporting the TZC, LLC Quality Plan's policies and procedures;
- TZC, LLC CQCM are responsible for the development and documentation of the Inspection and Testing Plan (see Inspection and Testing section of this Quality Plan); and
- The QM is responsible for developing TZC, LLC Quality Plan and its policies and procedures, and for performing audits to verify implementation of the provisions of this manual.

TABLE 2-1
TZC, LLC QMS Manual
Correlation To
NYSTA DB 113 Sections

	DB113 Section
TZC, LLC Quality Plan Section	
1.0 Organization and Responsibility	2
1.1 Continuous Improvement	2.2 & 3.12.1
2.0 Manual Preparation and Maintenance	2
3.0 Design Control	3.2
4.0 Document Control	3.3
5.0 Purchasing	3.4
5.1 Subcontractor Qualification	3.4.2
5.2 Field Receiving Inspection	3.8.2
5.3 Material and Equipment Storage and Maintenance	3.5 & 3.13
6.0 Product Identification and Traceability	3.6
7.0 Process Control	3.7
8.0 Work Activity Plan for Construction	3.1.2
8.1 Inspection and Testing	3.8
9.0 Monitoring and Measuring Equipment	3.9
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SECTION 3 – DESIGN CONTROL

Purpose

TZC, LLC Design Control policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.1.1 Quality System Procedures, Part A, B, E, F, J, R, U and BB and DB 113-3.2 Design Development; and DB 111 Design Management and Design Quality Assurance/Quality Control.

Scope

TZC, LLC will either oversee the design services of design consultants, or manage in-house design activities. In either case, TZC, LLC, including its design consultants, will ensure that the proper design controls are implemented.

TZC, LLC design control encompasses (see Figure 1):

- Identifying design requirements;
- Understanding and communicating design requirements;
- Identifying and planning design interface activities;
- Identifying, planning and executing design verification activities including those of Agency oversight;
- Verifying that design requirements are met; and
- Change control.

Policy

- It is the policy of TZC, LLC to plan and provide design documents that conform to the Contract requirements.
- In order to achieve this objective the design development and verification and validation activities will be based upon quality procedures documented in this Quality Plan.

Responsibility

TZC, LLC design services for permanent and temporary works will be performed in one of three ways:

- By the TZC, LLC prime design team (HDR and their subconsultants);
- By other temporary works design subconsultants; and
- By in-house temporary works engineering staff.

The prime design team and other temporary works design consultants will develop their own Design Quality Control Plan (DQCP) that will comply with the requirements of DB 111 and 113 as well as the policies of this Quality Plan section. These plans will be reviewed and approved by the TZC, LLC QM, TZC, LLC Design Quality Assurance service provider, and the NYSTA prior to their inclusion in the TZC, LLC QMS.

For design of temporary works performed by in-house engineering staff, a DQCP will be developed based on the prime design team's (HDR) DQCP by selecting the appropriate level of checking and internal QC procedures from that document.

TZC, LLC will retain the services of an independent Quality Assurance Engineering (QAE) Firm, reporting directly to the Quality Manager that will perform the contractually required design



quality assurance functions. The design quality assurance plan (DQAP) prepared by the QAE in compliance with Contract requirements will be incorporated into this Quality Plan.

The following then are specific responsibilities:

- The PM is responsible for ensuring that the procedures for Design Control are established and implemented and that the provisions of this section are provided to the appropriate TZC, LLC design consultants in the technical provisions of their consultant contract;
- The design management (prime design team, subconsultants, in-house) are responsible for understanding, communicating and implementing the provisions of this Section for their respective function and roles;
- The design quality control managers (DQCM) shall ensure that the process and procedures in their approved design quality control plans (DQCP) are followed, and perform a verifying QC audit prior to formal submittal; and
- The Design Quality Assurance Manager (DQAM) is responsible for performing audits to verify implementation of the provisions of this section.

For a more detailed description of design control please see the Attached:

- Design Quality Control Plan (DQCP); and
- Design Quality Assurance Plan (DQAP).

Design Control Process and Procedures (see Figure 1 below)

Identifying Design Requirements

The Tappan Zee Hudson River Crossing Project will be designed in accordance with the project Baseline, which includes the design definition stated in the prime contract and the other Baseline documents. These include the applicable government regulations, client-provided general specifications and standard details, the Licensor's process specifications (where applicable), and industry accepted codes and standards.

The order of precedence in case of conflict in the above requirements will be:

- a) Amendments, Orders on Contract and supplemental agreements;
- b) Part 1 - Agreement;
- c) Part 2 - DB Section 100 (except to the extent expressly otherwise provided in the Contract Documents);
- d) Part 3 - Project Requirements;
- e) Part 5 - Special Provisions;
- f) Part 4 - Utility Requirements;
- g) Part 7 - Engineering Data;
- h) The Directive Plans included in Part 6 - Request for Proposals (RFP) Plans;
- i) Part 8 - Special Specifications; and
- j) Part 9 - Design-Builders' Proposal (except as provided in the Contract).

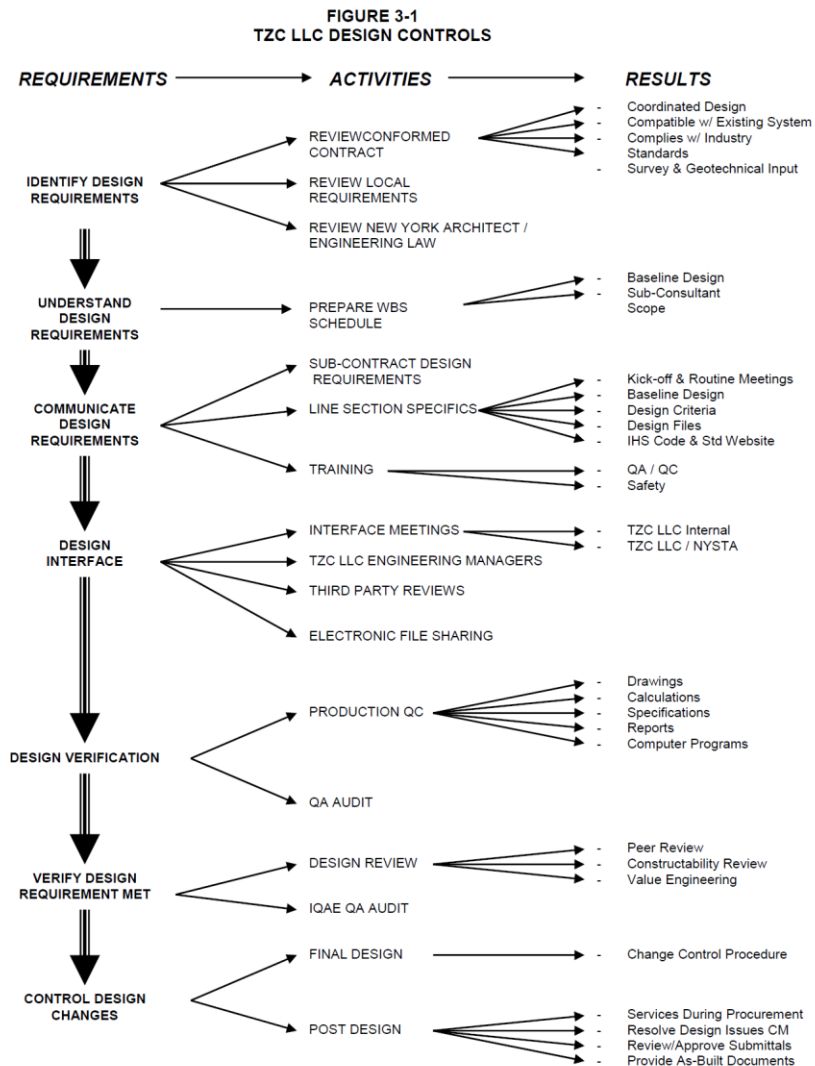
Ambiguities or contradictions between these documents or sections thereof will be resolved with New York State Thruway Authority.

Understanding and Communicating Design Requirements

The Design Team shall define the design basis for each required task in their scope of work based upon the design definition (e.g., criteria) provided in the prime contract. These requirements will be summarized in a Project Design Criteria document prepared by TZC, LLC, and included in the project Baseline. The design basis documentation will be controlled.

Once the design basis has been fully defined, modifications to the basic design definition will be performed only upon written agreement between New York State Thruway Authority and TZC, LLC. Omissions or other modifications to the design definition will be identified to New York State Thruway Authority and the design will be altered only upon agreement by and with direction from New York State Thruway Authority.

The Work Breakdown Structure (WBS) developed for the project will form the basis for identifying all engineering work.





Identifying and Planning Design Interface Activities

The Design Coordination Process is described below:

- **Technical Working Groups (TWG)** – This is a meeting that could include HDR, TZC, LLC, NYSTA and third-party stakeholders in which specific design details are discussed and resolved. These meetings are usually weekly.
- **Focus Group Meeting** – Meetings between HDR, TZC, LLC, NYSTA and the Local Jurisdictions in which specific design issues are discussed and resolved. If the issue cannot be resolved then the issue is elevated. The meetings will be held as needed.
- **Over the Shoulder Review Meeting** – The goal of this meeting with the NYSTA is to discuss and comment on the design prior to the formal review submittal using an “Over the Shoulder” review philosophy.
- **Constructability Review Meeting** – The Project Team conducts a constructability review at the Interim and Final design phases. Reviewers include members of the TZC, LLC. Operations and Maintenance and Safety. Comments are provided and reconciled with the HDR design team prior to the submittal.
- **Design Review Meeting** – TZC, LLC Design QA Manager conducts a review meeting after each formal submittal with the participation of HDR Design Manager, involved Area Manager and Design Leads, Design QC Manager, TZC, LLC Engineering Manager and/or responsible Project Engineer, as well as NYSTA and Third-party stakeholders.

Identifying, Planning and Executing Design Verification and Validation Activities

Identifying Design Verification and Validation Activities

NOTE: During the normal course of design document production, in-progress verifications (i.e., in-progress check prints, interim calculation checks, informal management reviews, etc.) are often performed. While important, these in-progress activities do not constitute the design verification activities that are planned and executed in accordance with the approved procedures referred to in this section.

Production Quality Control

This activity provides for an independent check of design documents (i.e., drawings, calculations, specifications, reports, etc.) at the production level. These checks are performed to verify a documents technical content and format compliance, and are typically documented through the use of check prints. Production quality control follows these policies:

- A qualified individual other than the one responsible for producing the document will check the document;
- Revisions to approved documents will be checked, reviewed and approved in accordance with approved procedures; and
- Checkprints will be retained as Quality Records.



Planning and Executing Design Verification Activities

TZC, LLC design verification and validation activities are either identifiably linked to the TZC, LLC production schedule or functionally available when needed, and performed in accordance with the provisions of this section. TZC, LLC design verification and validation activities are executed in accordance with the approved guidelines and procedures referred to in this section. TZC, LLC design verifications and validations are performed as follows:

- Production Quality Control (including but not limited to):
 - Checking of Drawings;
 - Checking of Calculations;
 - Checking of Specifications; and
 - Validating non-industry standard computer software.

Meeting Design Requirements

TZC, LLC verifies that the design requirements are met by:

- QA Review; and
- NYSTA Design Review process.

QA Review

This activity ensures that design documents have had the required production quality control checks and methodology reviews prior to submittal to NYSTA. These reviews take the form of checklist verification and quality assurance audits, and follow these policies:

- Reviews shall be scheduled activities; and
- Reviews shall be documented (checklists and QA audit reports) and retained as part of the project file.

Quality Assurance Audit

The DQAM will schedule and perform a quality assurance audit prior to the scheduled submittal of design documents to NYSTA to independently verify that the required production quality control checks and management reviews have been performed and properly documented. This audit will be performed in accordance with the DQAP (attached).

NYSTA Design Review

NYSTA reviews TZC, LLC design submittals as described below in accordance with the Contract and TZC, LLC response to NYSTA review comments will be documented and retained as part of the project file.

- Definitive Design Submittal – Reviewed by NYSTA and other Project Stakeholders
- Interim Design Submittal– Review by NYSTA and other Project Stakeholders
- Early Construction Start Review Submittal (optional) – Reviewed by NYSTA and other Project Stakeholders and may be used to satisfy a portion of the requirements for Readiness for Construction
- Final Design Submittal – Review by NYSTA and other Project Stakeholders
- Readiness for Construction Submittal – Signed and Sealed Drawings ready for construction



Design Change Control

Change Design Control Activities

The goal of design change control procedures is to ensure a systematic review, approval and coordination among all project stakeholders of changes to a baseline design configuration.

Post-Design Activities

TZC, LLC post design activities include, but are not limited to:

- Design services during procurement periods;
- Supporting construction management in resolving any design issues;
- Review and approve subcontractor submittals; and
- Provide as-built documents.

TZC, LLC post-design activities have the potential for introducing changes to the baseline construction documents. Any change to these baseline documents will be performed in accordance with the Design Change Control Procedures described above.

Attachments

Design Quality Control Plan (rev. 1, April 12, 2013) - HDR

Design Quality Assurance Plan (rev. 1, March 12, 2013) - GPI

Design Quality Control Plan
for the
Tappan Zee Hudson River Crossing Project

Contract D214134
PIN 8TZ1,00
Project TA#: TANY 12-18B

Revision 1
April 12, 2013

Prepared by
Tappan Zee Constructors
555 White Plains Rd., Suite 400
Tarrytown, NY 10591

Daniel E. Domalik
Design Quality Control Manager

Revision No.	Design Package No. or Description	Date
Rev 0	Initial DQCP	02/19/2013
Rev 1	Revised for NYSTA comments	04/12/2013

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Acronyms

CADD	Computer Aided Drafting and Design
C/A	Corrective Action
CAR	Corrective Action Request
CQAM	Construction Quality Assurance Manager
CQCM	Construction Quality Control Manager
CQMP	Construction Quality Management Plan
CR	Constructability Review
DA	Design Assessment
D-B, DB	Design-Build
DCE	NYSTA's Design Compliance Engineer
DCPR	Design Control Procedure(s)
DD	Definitive Design OR Design Director
DDL	Design Discipline Lead
DDR	Definitive Design Review
DM	Design Manager
DQAM	Design Quality Assurance Manager
DQAP	Design Quality Assurance Plan
DQCM	Design Quality Control Manager
DQCP	Design Quality Control Plan
DR	Design Review
IAC	Independent Analytical Check
IDR	Interdisciplinary Review
MR	Management Review
NCN	Non-Conformance Notices
NCR	Non-Conformance Report
NYSDOT	New York State Department of Transportation

NYSTA	New York State Thruway Authority
P/A	Preventive Action
PDMP	Project Document Management Plan
PM	Production Manager OR Project Manager
QA	Quality Assurance
QAEF	QA Engineering Firm
QC	Quality Control
QCR	Quality Control Review
QM	Quality Manager
QMO	Quality Management Oversight
QP	Quality Plan
QMS	Quality Management System
RFC	Readiness for Construction
TWG	Technical Work Group

Definitions

Agencies – The Authority and the Department. The term “Agency” is sometimes used to mean either the Authority or the Department.

Analytical Check – See Independent Analytical Check.

Authority – The New York State Thruway Authority.

Backchecker – A Design Team member that reviews Checker comments and agrees or disagrees with edits proposed by the Checker. The Backchecker is generally the Originator.

Checker – A Design Team member, independent of the work product being checked, that performs a Detailed Check of the work and provides suggested changes.

Constructability Review – A review conducted by Tappan Zee Constructors Joint Venture construction personnel to assess the constructability of a particular Design Package.

Corrective Action – Action to eliminate the cause of a detected nonconformity or other undesirable situation in order to prevent recurrence.

Corrective Action Request – The form used to document the nonconformity, its root cause(s), the recommended corrective action, and the verification of implementation.

Critical Structural Member – Main load-carrying member that would have a significant negative impact on the integrity of the structural system if its capacity or function was compromised

Definitive Design Review – Review of Definitive Design conducted by the Design-Builder's Design Quality Assurance Manager, with participation by the Agencies and Stakeholders, as described in DB §111-8.1.

Department – The New York State Department of Transportation.

Design Assessment – Also known as a Quality Control Review; Part of the Independent Design Check; A review of design documents for general compliance with contract requirements.

Design Builder – The contractor partners that have formed Tappan Zee Constructors.

Design Compliance Engineer – The Agencies' representative with primary responsibility for monitoring and/or auditing the Design-Builder's design and engineering activities for compliance with the Contract requirements.

Design Control Procedures – Procedures defined in this Design Quality Control Plan that provide specific instruction on the implementation of quality control and quality assurance requirements.

Design Discipline Lead – Individual(s) responsible for the overall coordination and management of the design functions related to a specific discipline of engineering.

Design Quality Assurance Manager – The person appointed by Design-Builder who reports directly to the Design-Builder's Quality Manager and is responsible for the QA of all Work conducted by the Designer. The Design QA Manager shall be a New York-licensed professional engineer with similar experience as the Design Manager. The Design QA Manager shall be responsible for coordinating the schedule of Design QA activities with the Design-Builder's design activities.

Design Quality Assurance Plan – The processes and procedures developed by the Design Quality Assurance Manager to define the design quality assurance and independent design quality assurance requirements for the Project.

Design Quality Control Plan – The processes and procedures developed by the Design Quality Control Manager to define the design quality control and internal design quality assurance requirements for the Project.

Design Quality Control Manager – The person appointed by Design-Builder who reports directly to the Design-Builder's Design Manager and is responsible for the QC of all Work conducted by the Designer. The Design QC Manager shall be a New York-licensed professional engineer with similar experience as the Design Manager. The Design QC Manager shall ensure that checkers are assigned for each design discipline and for each Design Unit and that they are properly scheduled.

Design Review – A comprehensive and systematic examination of the design as specified in the Contract to verify that it is in conformance with the requirements of the Contract, as performed by the Design-Builder for all stages of the design except As-Built Plans, which is performed by the Agencies. During all stages of the design, except As-Built Plans, the Agencies will contribute to the review through Oversight including participation, auditing and spot-checking.

Design Team – HDR and its design subconsultants.

Detailed Check – A comprehensive documented check of the calculations, specifications, and drawings to confirm the correctness of the design.

Independent Analytical Check – Part of the Independent Design Check; A method of quality control using separate calculations (and without reference to Designer's calculations) to establish the structural adequacy and integrity of critical structural members.

Independent Design Assessment – See Design Assessment.

Independent Design Check – The check of the design of permanent components, major temporary components, and effects of temporary components by senior personnel who are independent of the production of the work being reviewed. Consists of Design Assessments and/or Independent Analytical Checks.

Independent Design Quality Assurance – The activities of the QA Engineering Firm to oversee, manage, certify and perform design QA activities as specified in DB §111, other Contract Documents and the Design-Builder's Quality Plan.

Interdisciplinary Review – A review of a particular discipline's design by other disciplines to promote consistency and eliminate conflicts among disciplines.

Internal Design Quality Assurance – The processes used by the DQCM to confirm the QC documentation is in substantial compliance with the DQCP and the design meets the requirements of the Contract Documents prior to submitting the document(s) to the DQAM to initiate Independent Quality Assurance activities.

Management Review – The regular review of the Quality Plan by the Design-Builder's Project Executive to ensure its continuing suitability and effectiveness in satisfying the requirements of the Contract and the Design-Builder's stated quality policy.

Non-Conformance Report – The written documentation of deficiencies, instances of non-compliance, errors, and/or omissions in the Work, per DB §105-16. The Non-Conformance Report is a means and method to document findings brought forth by either the Design-Builder or the Agencies at any point

during the Project design or construction to identify non-conforming items that shall be documented and managed until Final Acceptance.

NYSTA Oversight – See Oversight.

Originator – A Design Team member who generates a design product, e.g. calculations, drawings or reports. The Backchecker does not have to be the Originator.

Oversight – Actions by the Agencies to satisfy themselves that the Design-Builder is designing, constructing and managing the Work in accordance with the Contract Documents. It includes actions identified in the Contract Documents by the terms Independent Assurance, Verification Sampling and Testing, compliant/compliance, accept/acceptance, inspect/inspection, audit, confirm, review, verify or terms of similar import. Agencies' comments as a result of Oversight are conveyed to the Design-Builder through consultation and written comment. Neither the activity of Oversight nor the lack of consultation and written comment on the part of the Agencies shall be construed to relieve the Design-Builder and its organization from the responsibility and costs for meeting all Contract and regulatory requirements.

Peer Review – An review performed by senior professionals of the design parameters and approach used in the Geotechnical Data Reports, Geotechnical Interpretive Reports, and Highway Design Parameters. Peer Reviews will be documented in reports of review findings.

Project – The improvements to be designed and constructed by the Design-Builder and all other Work product to be provided by the Design-Builder in accordance with the Contract Documents.

Project Document Management Plan – The portion of the Project Management Plan that defines processes for the organization, storage, transfer, and retrieval of project records.

Project Office – The co-located office at 555 White Plains Road, Suite 400, Tarrytown, NY 10591.

QA Engineering Firm – The independent engineering consultant(s) retained by Design-Builder responsible to oversee, manage, certify and perform design and construction QA activities. The QA Engineering Firm (and any firm(s) acting as a subconsultant to the QA Engineering Firm) shall not be owned by or be an affiliate of the Design-Builder, any Principal Participant, the Designer or any construction Subcontractor. The QA Engineering Firm shall be responsible for management and scheduling of all QA activities for all items of Work for this Contract.

QA Inspection – Quality Assurance inspections performed by the QA Engineering Firm in accordance with DB §§112 and 113.

QA Sampling and Testing – Sampling and testing performed by the QA Engineering Firm independently of the Design-Builder production or QC Inspectors.

QC Activity – Any of the tasks identified on the Project Check Print Stamp; performing tasks associated with an Interdisciplinary or Quality Control Review; or, responding to and/or incorporating comments generated during a Constructability Review.

Quality – The degree to which a product or service conforms to a given requirement.

Quality Assurance – All planned and systematic actions by the QA Engineering Firm necessary to confirm QC is performed in accordance with the Quality Plan, that all Work complies with the Contract and that all materials incorporated in the Work, all equipment, and all elements of the Work will perform satisfactorily for the purpose intended.

Quality Control – The total of all activities performed by the Design-Builder, Designer, Subcontractors, producers or manufacturers to ensure that the Work meets Contract requirements. For design, this

includes, but is not limited to, procedures for design quality, checking, design review including reviews for constructability, and review and approval of Working Plans. For construction this includes procedures for materials handling and construction quality, inspection, sampling and testing of materials, plants, production and construction; material certifications; calibration and maintenance of equipment; production process control; and monitoring of environmental compliance. Quality Control also includes documentation of all QC design and construction efforts.

Quality Control Review – See Design Assessment.

Quality Manager – The individual employed by the Design-Builder who is responsible for the overall Quality Plan and Quality Assurance activities of the Design-Builder, including the quality of management, design, and construction.

Quality Management Oversight – See Oversight.

Quality Plan – The Design-Builder's plan for implementing the Design-Builder's overall Quality Management System and associated activities, including Design-Builder's QC/QA and procedures to assure and document quality of design and construction activities through reviews, inspections, testing, internal communications, and necessary interfaces with the Agencies and the Agencies' Oversight activities.

Quality Management System – The overall quality system and associated activities, including Design-Builder QC and QA activities, Agencies' Oversight and IA program and associated Quality Plan that will assure materials and workmanship incorporated into the Project are in conformity with the Contract requirements, Design Documents and Project Specifications.

Readiness for Construction – The stage of design development after Final Design where the Design Plans and Project Specifications for a Design Unit or a component thereof are 100% complete and satisfy the requirements of DB §111-11.6.

Rechecker – A Design Team member with technical knowledge and qualifications necessary to determine if edits proposed by the Checker and agreed to by the Backchecker have been properly incorporated into the design product, e.g. calculations, drawings or reports, by the Updater. The Rechecker is generally the Checker.

Technical Work Group – Meetings held to coordinate the design development within the Design-Builder's organization and the Authority and other affected Agencies as needed.

Updater – A Design Team member with technical knowledge and qualifications necessary to incorporate edits, agreed to be incorporated by the Checker, into the design product, e.g. calculations, drawings or reports. The Updater may be the Originator and/or Backchecker.

Working Plans – Those plans prepared by the Design-Builder to supplement Design Plans to specify additional details and procedures for construction of the Project, including the following:

- A) Construction details;
- B) Erection plans;
- C) Fabrication plans;
- D) Transportation plans
- E) Storage plans

- F) Field design change plans;
- G) Stress sheets;
- H) Shop plans;
- I) Lift plans;
- J) Bending diagrams for reinforcing steel;
- K) Falsework plans; and
- L) Similar data required for the successful completion of the Work.

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1.0 Quality Management

This Design Quality Control Plan (DQCP) applies to the design activities of the TZHRC Design-Build Project (Project). It defines the following specifically for design quality control:

1. Design Quality Policy and Goal
2. Internal Design Quality Assurance Goals
3. Design Quality Control Organization / Personnel
4. Design Quality Control Planning and Processes
5. Design Quality Control Program (QC Processes and Procedures)
6. Internal Design Quality Assurance Processes
7. Design Quality Control Improvement
8. Design QC and Internal QA Training.

A separate Construction Quality Management Plan (CQMP) and Design Quality Assurance Plan (DQAP) will be developed for the construction and independent quality assurance activities. An overall Quality Plan (QP) will define the scope of the entire Quality Management System including its component plans.

1.1 Design Quality Policy and Goal

The Tappan Zee Constructors (Design-Builder) team is committed quality at all levels of the Design-Build (D-B) team. The Design-Builder's executive management will provide a definition and endorsement of its Quality Policy in the Project Quality Plan, including objectives for quality and its commitment to quality. The statement will explain the Design-Builder's commitment to quality and the responsibility the Design-Builder has for assuring that it meets the quality requirements of the contract. The Design-Builder's commitment to quality, and the organization's quality objectives, will be posted in the TZHRC Project office.

Responsibility for and commitment to the Design Quality Policy starts at the highest level of management shown in Appendix A, and extends to Project employees and subconsultants at all levels. This DQCP describes the Design Quality Organization, and identifies the overall requirements, guidelines, and responsibility for developing and implementing Internal Quality Assurance (QA) and Quality Control (QC) processes associated with the preparation of the design documents. The Design Quality Assurance Manager (DQAM) provides independent QA over the design process and certifies QC procedures have been followed in accordance with the Contract. This includes the performance of documented reviews to verify that the DQCP is being followed. The Design Quality Control Manager (DQCM) is responsible for preparing the DQCP with associated design quality processes and procedures and for training the design team in the quality procedures. This training will include a formal indoctrination of the design quality policy.

In support of the Design-Builder's Quality Policy, the following is a statement of the Design Team's Quality Policy:

"Quality is the responsibility of each person working on the Project. The Design team will be organized in such a manner that quality is achieved and maintained by those responsible for performance of the work and that the quality achievement is verified by persons or organizations not directly responsible for performance of the work. Quality will be built in – not added on. The benefits of continuous improvement will be integrated into our basic operating principles – and by extension our operating practices."

This DQCP will apply to the Design Team on the Tappan Zee Constructors team. The Design Team involved in QC Activities will be trained in the QC processes and procedures. Use of this DQCP by all Design Team members will provide for uniformity of the QC processes and facilitate internal reviews of the QC documentation. Although certain QA/QC tasks may be assigned to subconsultants, overall design QC and internal design QA accountability will remain with the DQCM. Design quality non-conformances

will be documented and resolved prior to continuing the performance of the work activity. The Design QC procedures are provided in Appendix B. Forms shown in Appendix C are examples. The actual forms used may vary from these examples. In addition, integrating the benefits of continuous improvements into our basic operating principles - and by extension our operating practices – is an important concept of our QMS. The DQCP also promotes prevention and a proactive approach, and focuses on documenting and continuous improvement of the delivery processes.

The Goal of the DQCP is to provide a systematic design quality framework so that deliverables meet the Project requirements.

1.1.1 Agency Review of Design Packages

Prior to the submittal of a package, the Design Team will review the design package to verify that the contract requirements applicable to the completion level of the submittal are included. The Design Team understands that for verification purposes, the Authority will also perform a review of the design packages against the Contract Requirements. These efforts will not relieve the Design Team of responsibility for checking all Work and ensuring it is in accordance with contract requirements. Additional detail is provided in Section 1.4.3 Design Review Meetings and Section 1.4.4 Authority Oversight.

1.1.2 Updating the Design Quality Control Plan

As work progresses, the DQCP will be updated to reflect current conditions. Either the D-B or the Authority's Project Manager may identify the need for revisions that will be submitted to the Authority for review. The DQCP will be submitted to the Authority for review within 30 days of the DQCM identifying the need of a formal revision. The DQCP will be submitted to the Authority for review annually (within 12 months of NTP or receipt of last Approval from the Authority's Project Director) even if no revisions have occurred during that 12-month period. To facilitate review by the Authority, the conformed copy of the revisions will be submitted in track changes so that the revisions can be easily identified.

The DQAM along with the DQCM will develop and maintain the Design Quality Assurance Plan and Design Quality Control Plan, respectively. The DQCP and each procedure within it will be identified by a revision number. During the course of the Project, changes to these procedures and processes may be identified by the Project team. When this occurs, the DQCM will draft changes to the DQCP and discuss the changes with the DQAM who will seek approval from the Authority. Upon informal acceptance of the change, the DQCM will distribute the process improvement via a "Preventive Action" e-mail to the Design Discipline Leads. At that point, the revised procedure will be used by the design team. Preventive Action e-mails will be stored in ProjectWise at the following link: [16.04 Preventive Action](#).

pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control Plan\16.04_Preventive Action\

1.1.3 Coordination with Other Documents

This DQCP will be coordinated with the DQAP, the overall Quality Plan, and other Management Plan documents. The DQCM will interface with the owners of these plans directly and through the Quality Manager for review purposes and to communicate changes. The goal is to achieve consistent terminology, integrated processes, and efficiency by reducing "gaps and overlaps" between documents.

1.1.4 Agency Review of Responsible Engineers and Responsible Architects (Design Discipline Leads)

Within 30 days of Notice To Proceed, the Design Manager will develop a list of the Responsible Engineers and Responsible Architects (Design Discipline Leads) on the Design Team for each Design Unit and submit brief resumes of these Design Team members to the Agencies for review and comment. The Design Manager will review the list periodically to assess necessary changes to the list. The Design Manager will submit brief resumes for those Responsible Engineers and Responsible Architects who

have been added to the list to the Agencies for review and comment. The list and brief resumes shall be maintained in ProjectWise at the following link: 16.13_ Responsible Engr & Arch List & Resumes.

pw:\\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control Plan\16.13_ Responsible Engr & Arch List & Resumes\

1.1.5 Design Firm Roles and Relationships

The roles of the various design firms and their relationships with each other and other stakeholders are shown in the Project design organization chart. All design activities are subject to the DQCP requirements. The organization chart is provided at the following link: 01.00_Project_Guide

[pw:\\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\01.00_Project_Guide\](pw:\\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\01.00_Project_Guide)

1.2 Design Internal Quality Assurance Goals

The Design team is committed to delivering a quality project. In order to provide the QAEF with work that complies with the Contract and DQCP requirements, the DQCM will perform Internal Quality Assurance activities which are shown below. These activities are intended to promote compliance with both project-level and corporate QA/QC requirements. They supplement the Independent QA activities of the QAEF, they do not replace them.

1. All personnel involved in the QC process will receive QC training. A record of the training will reside in the Project database (ProjectWise).
2. A sampling of QC documentation for each design package (Scheduled Audit) will be reviewed against the appropriate DCPR. Nonconformances in the QC process will be corrected prior to the submittal. The DQCM will provide documentation of each review (See DCPR-13).
3. The DQCM will confirm that design submittals are complete prior to submitting to the DM and DQAM.
4. The DQCM will perform a periodic review of the Design Quality Control System (Periodic Audit) and recommend improvements based on these reviews. Periodic Audits of DQCP compliance and effectiveness will occur no less than twice a year during the design phase of the Project.

1.3 Design Quality Control Organization / Personnel

The Design-Builders' executive management shall have overall responsibility for success of the QMS and shall ensure that responsibilities and authority are defined and communicated within their organization. The DQAM shall be responsible for all Design Quality Assurance activities excluding the management of QC activities and internal audits performed by the DQCM (both defined in DCPR-13).

The D-B's Quality Manager is responsible for overseeing the Quality Plan, which includes the DQCP, and the preparation, implementation and update of the Quality Plan for the D-B. The DQCM will coordinate with the QM and DQAM to ensure the DQCP, and revisions, are consistent with the Quality Plan and the DQAP, respectively. The DQCM will support the QM to meet Authority requirements.

The DQCM shall be responsible for all Design Quality Control Activities. The DQCP, including the DCPRs in Appendix B, have been developed to document procedures, instructions, and process controls to ensure the Work being produced by the design team meets the requirements of the Contract Documents. The DQAM will review and approve, by signing the cover page, the DQCP prior to submittal to Authority. The DQAM shall be responsible for assuring, certifying, and providing documented evidence that the Work submitted meets the requirements of this DQCP by signing the DQAM Certification Form (see DQAP).

1.3.1 Responsibility and Authority

The design team organizational chart in Appendix A demonstrates a commitment to an effective quality program to ensure design Work meets the requirements of the Contract Documents. Since quality is the responsibility of each person assigned to the Project, the organization chart graphically depicts the principal quality participants, showing lines of responsibility, authority, communication, and relationships with the persons who interface directly with the Authority. The complete org chart is stored in ProjectWise in folder 01.00_Project Guide.

Because each design team member has a responsibility for quality, the design team will have the responsibility to:

- Initiate preventive action to prevent the occurrence of Nonconforming Work (See DCPR-15).
- Assist the DQCM during the corrective action process to identify, evaluate, and document possible root cause(s) of nonconformances (See DCPR-15).
- Recommend or initiate quality process improvements through the DQCM.
- Assist the DQCM with the implementation of quality process improvements.

The DQCM will have the primary responsibility to identify and record possible problems relating to the design quality control processes.

Whenever a person or position is referred to in this DQCP, it is understood that this person or position may delegate assigned tasks as appropriate.

1.3.2 Design Manager (DM)

The general roles, interfaces, and responsibilities for design quality reside with the Design Manager. The DM shall ensure the Design Discipline Leads and supporting staff adhere to the Quality Control processes and procedures described in Appendix B, in compliance with this DQCP. The DM will follow the detailed Design Control Procedures (DCPR) outlined and described in this DQCP to control, document, verify and validate the deliverables. Design control includes verifying that the design requirements are understood and incorporated by production staff, planning the design interfaces and design verification activities, executing design verification and Quality Control Activities, and controlling design changes throughout development of the design documents.

In support of the QMS, the DM will also:

- Approve by causing design inputs to be stored in ProjectWise;
- Verify that the Project file is current;
- Review the design schedule with the DDLs and DQCM to identify resource requirements so the Design Team has sufficient trained resources available to manage the project, complete assignments on time, and perform QC and internal QA tasks in accordance with the requirements of the contract;
- Keep the lines of communication open with the Authority;
- Review the development of drawings, reports and specifications to be Issued as Readiness for Construction (RFC) and subsequent design changes after RFC on a regular basis. Verify that the responsibilities of the team members are being carried out;
- Ensure that interdisciplinary coordination is occurring and participate in the QC/QA process when required;
- Monitor the work of subconsultants and subcontractors and keep them up-to-date on Project decisions and quality requirements; and,
- When design packages are completed, sign a certification form verifying the submittal meets the quality standards as specified in the contract.

1.3.3 Design Quality Assurance Manager

As shown in the organization chart, the DQAM, an employee of the Independent QA Engineering Firm, will report to the Design-Builder's Quality Manager and be independent of the Design-Builder's Project Manager. The DQAM and staff will have no responsibilities for or involvement in the production of the work. Additional responsibilities for the DQAM are described in the Design QA Manual which is in Part 3 - Design Control of the overall Quality Plan..

1.3.4 Design Quality Control Manager

As shown in the organization chart, the DQCM will report to the DM and be independent of the Design Team's technical disciplines. The DQCM is responsible for implementing the DQCP to achieve compliance with the Design Quality Goals and train the design personnel in the Design Control Procedures (DCPRs). The DQCM is responsible for scheduling the necessary QC Activities for each deliverable to ensure that all design QC Activities are in compliance with the DQCP. The DQCM shall ensure that the Design Discipline Leads have assigned the necessary Checkers and Reviewers for each Design Unit. The DQCM and staff will have no responsibilities for or involvement in the production of the work. The DQCM will also facilitate, monitor, and verify subconsultant compliance with the DQCP.

The Design Quality Control Manager shall also have the following responsibilities:

- Facilitate compliance of Work with the requirements of the Contract Documents and the Approved DQCP.
- Provide adequate resources and trained personnel for Quality Control Activities.
- Ensure the adequacy and enforcement of design quality control procedures and processes.
- Establish and implement procedures to control and ensure the Work performed by design subconsultants meet the requirements of the Contract Documents.
- Ensure the DQCP is being implemented and report in writing to the DM and DQAM in support of the Management Reviews and other reporting requirements.
- Ensure that quality records are properly prepared, completed, maintained, and delivered to the DQAM, as required by the Contract Documents, to provide evidence of Quality Control Activities performed.
- Through the use of the design schedule, confirm that checkers and reviewers are assigned for each discipline and Design Unit and that QC Activities are properly scheduled.
- Work with the QM and DQAM as needed to respond to audit findings, corrective action requests, Management Review action items, and other design-related issues.

1.3.5 Design Discipline Leads

The Design Discipline Leads (DDL) are responsible for the design and checking of their design team's work. The DDLs will manage the design checking efforts and coordinate with the DM to assign the staff who is not the Originator of the design products being checked. The DDL will monitor the reviews by the QC Reviewers and will mediate disagreements between the designer and the reviewers.

1.3.6 Responsible Engineer and Responsible Architect

A Responsible Engineer or Responsible Architect, as applicable, will sign and seal the design report, design plan, Working Plans, and/or specifications, as appropriate, for each design Unit. Responsible Engineers shall be New York-Licensed Professional Engineers. Responsible Architects shall be New York-registered architects. The qualifications for Responsible Engineers and Responsible Architects will be submitted to the Agencies for review and comment as described in section 1.1.4. The Responsible Engineers and Responsible Architects may be the DDL or other design professional in responsible charge of the design.

1.4 Design Quality Control Planning and Processes

The DQCM has established the following planning methods in order to meet the requirements of the Contract Documents and meet the goal of the DQCP which is to provide a systematic design quality framework so that deliverables meet the Project requirements. The Plan promotes prevention and a proactive approach, and focuses on documenting and continuous improvement of the design delivery processes.

The Project Management Plan will establish and document the method of scheduling, monitoring, and reporting on the status of the design deliverables.

1.4.1 Technical Work Group (TWG) Meetings

The Design-Builder shall conduct and lead regular TWG meetings to coordinate the design development within the Design-Builder's organization and the Authority and other affected Agencies as needed. As a minimum, the Design-Builder shall prepare an agenda and conduct each meeting to discuss the status of the design, coordinate the design development between design disciplines, discuss constructability issues, and identify any questions associated with design requirements. The Design-Builder shall take meeting minutes and provide draft minutes to the attendees within 5 Working Days after each meeting.

1.4.2 Peer Reviews

For specific documents of a more subjective nature, a Peer Review by senior professionals of the design parameters and approach used will be conducted. Peer Reviews will be used for the

- Geotechnical Data Reports,
- Geotechnical Interpretive Reports, and
- Highway Design Parameters.

Peer Reviews will be documented in reports of review findings.

1.4.3 Design Review Meetings

The DQAM shall hold design review meetings at stages (Concept, Definitive, Interim, Final, and Readiness for Construction Design) of the design development process, in the Project office, or otherwise agreed to by the Authority, and invite the Authority to attend. The Responsible Engineer or Responsible Architect shall be present in the Project area for, and shall attend all Design Reviews for assigned Design Unit(s). The design review meetings shall be scheduled, conducted, and documented by the DQAM. The meetings minutes shall be taken by the DQAM and submitted to Authority within 5 Working Days after each meeting. Design Reviews will be conducted for each Design Unit and for 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. For additional detail, please refer to the DQAP.

The Authority will forward, through the DQAM, Agencies and Stakeholder comments (if any) from Design Reviews recorded on Form DR, or in a similar format approved by the Agencies to the Design Team. When received, the Design Team shall respond to review comments using the same form. If the Design Team agrees with the comment, the Design Team will respond with the Initial Disposition and provide a response describing how the comment will be incorporated in the design. If the Design Team disagrees with the reviewer's comment, the Design Team's response will provide the basis of the disagreement.

1.4.4 Authority Oversight

The Design Team understands that the Authority's Oversight activities related to design quality may also include the following:

- A. Meeting with the Design Manager;
- B. Verifying design progress;
- C. Partnering;
- D. Auditing the subcontracting process;
- E. Conducting management reviews;
- F. Participating in progress meetings;
- G. Reviewing baseline schedules and updates;
- H. Reviewing management-related plans;
- I. Reviewing compliance and control;
- J. Providing consultation (or acceptance in the case of As-Built plans);
- K. Performing Design Oversight; and,
- L. Performing audits of the implementation of Quality Plan.

At the request of the Agencies or the Design-Builder, over-the-shoulder reviews (OTS) may be scheduled to keep parties informed of the status, quality, and consistency of design efforts. Over-the-shoulder reviews are intended to be interactive and to reduce the likelihood of surprises or miscommunications in the design process. Although the intent of an OTS is not to make decisions, any decisions made in over-the-shoulder reviews may be documented and distributed by the Design-Builder in a Request For Information or letter to the Authority.

1.4.5 Readiness for Construction Documents

Following the Readiness for Construction Review Meeting for an applicable design package and incorporation of agreed to comments, the Design Team will issue Readiness for Construction documents. These documents will be signed and sealed by the applicable Responsible Engineer or Responsible Architect and identified as revision "0" in the revision block. See Section 1.4.15 for more info on identifying document status. See DCPR-17 Readiness For Construction (RFC) for more detailed information.

1.4.6 Revisions to Readiness for Construction Documents (after DQAM Certification)

Changes to a design document after the certification by the DQAM and Issued as Readiness for Construction will be treated as a new design for QC purposes. The revised design document will be Checked and/or Reviewed, as described on the Design Development and QC Process Documentation Form for the proposed change, commensurate with the degree and nature of the change. Changes to design documents that have been Issued as Readiness for Construction will be identified, documented, reviewed and approved by authorized personnel before their implementation, with full consideration for impacts to ongoing or completed Work as described in DCPR-09 Revisions to Readiness for Construction Documents. Changes may be initiated by the Agencies' request or by the Design Team or Contractor. Any proposed changes shall be reviewed and approved by the Responsible Engineer or Responsible Architect who produced the original work if available; otherwise, approval will be provided by the alternate Responsible Engineer or Responsible Architect. Changes shall be responsive to the design input and shall be verified for consistency with relevant previously accepted designs. The Notice of Design Change form will be used to inform the Contractor and to document Contractor approval of proposed design changes.

Changes to previously Issued as Readiness for Construction (RFC) documents will be in a format that can enable changes to be readily apparent and trackable. The procedure for identifying revisions to RFC documents is described in DCPR-09 Revisions to Readiness For Construction Documents. For drawings, revisions will be identified in the revision block and the current revision identified by a revision cloud and revision triangle. Previous revision clouds and revision triangles will be removed if the drawing is subsequently revised.

Revisions to previously RFC MS-Word documents will be identified using the “track changes” function. Additions to the document will be underlined and deletions will be in “revision balloons” in the right-hand margin or struck through in the text. A clean copy of the text document and a copy showing the edits will be provided. The version of a text document will be identified in a revision block on the cover of the document, i.e. reports and studies, or in the footer, i.e. specifications.

1.4.7 As-Built Documents

As-Built Documents shall be submitted to the Authority for Acceptance. The Authority may audit As-Built Documents to ensure completeness and compliance with the requirements of the Contract Documents. The Authority will not Accept As-Built Documents until the Design-Builder has addressed, resolved, and incorporated, to the satisfaction of the Authority, any prior Design-Builder or the Authority comments. The Design-Builder shall ensure and provide documentation to the Authority that all review comments have been addressed. Significant changes noted between the RFC submittal and the As-Built drawings are to be documented via an NDC process as per DCPR-09 if the design is impacted.

DCPR-14 will describe the procedures for developing and submitting As-Built drawings. As-Built Documents shall show all changes. All changes shall be noted using CADD. Hand drawn changes will not be accepted.

The As-Built Documents submittal shall include:

- All plans reflecting Readiness for Construction Documents or Revisions to Readiness for Construction Documents.
- Resolution of noncompliance
- Design calculations
- Design reports
- Specifications
- Electronic CADD files, as specified elsewhere in the Contract Documents
- As-Built GIS Model and Database

DCPR-09 will describe the process for a Licensed Engineer or Architect in responsible charge for the design to prepare, review, and approve all changes, including field design changes, of Issued as Readiness for Construction Documents, and As-Built Documents. DCPR-09 also provides a procedure to communicate and receive approval for design changes to previously Issued as Readiness for Construction documents on a timely basis consistent with the progress of construction Activities. The Design-Builder shall maintain a master list of approved design changes. The DM will be responsible for maintaining and distributing the list to Project personnel.

The QM will certify that all non-conformance reports are addressed and resolved, the Project has been designed and constructed in accordance with Contract requirements, and the As-Built Plans comply with the Contract requirements. Refer to DCPR-14 for a description of the As-Built procedures.

1.4.8 Contract Commitments

The design team will deliver Form DUS to identify Project Design Unit deliverables and their timing. The DQCM will use this to plan to schedule the necessary Quality Control personnel. The design team will also develop a Basis of Design (Design Criteria) summary to assure the design meets the requirements of the Contract Documents including environmental commitments and Work Zone Traffic Control requirements. The requirements of the DQCP will be verified by the DQCM during the Review of QC Documentation (See DCPR-13).

1.4.9 Compatibility

The Design Team will use an Interdisciplinary Review (IDR) of the design to identify conflicts and assure the design is compatible across the various disciplines. A Constructability Review (CR) will be used to gain input from the Design-Builder's construction staff regarding constructability and installation. See DCPR-11 for more details about the IDR and CR. TWG meetings will be used to achieve real-time input from Authority, stakeholders, the design team, and construction personnel.

1.4.10 Design Deliverables

The Design-Builder understands, and will plan for, that unless otherwise specified in writing, Authority will respond to Submittals submitted for Review, Acceptance or Approval within the timeframe specified in the Contract Documents.

The design deliverables shall be delivered to Authority indexed and clearly marked to indicate the date of issue and stage of development (e.g., Readiness for Construction Documents). All design deliverables shall include a title block, consistent with the standard Project drawing format with the following information:

- Date of issuance including all prior revision dates
- Contract title and number
- The names of the Design-Builder, Subconsultants, Subcontractors, Suppliers, and manufacturers as applicable
- Subject identification by Design-Builder drawing or Contract reference

RFC design deliverables shall be sealed by the Professional of Record consistent with applicable Project and Legal Requirements. All design deliverables shall include a sufficient blank space on the drawings, cover sheet of calculations reports or studies, and the seal page(s) for specifications in which the Professional of Record can affix his/her seal, signature and date.

Standard Specifications, supplements to the same, or new specifications will be developed as needed and made available for Design Reviews.

The CADD drawings and associated documents shall be organized in a logical manner, have a uniform and consistent appearance, and clearly depict the intent of the design and construction. CADD files shall conform to the Authority's Standards. All CADD files shall be documented with information describing the path, file name, and description.

1.4.11 Measurement of Contract Document Requirements

The conformed contract, change orders and Basis of Design will reside in ProjectWise in a directory that is accessible by Project personnel.

1.4.12 Quality Records

The DQCP, Form DUS, Design Quality Control Records (e.g., review markups, signature sheets & forms, signed check prints, comment matrices, etc.), and Internal Design Quality Assurance Records (e.g., training materials and records, Internal Design Quality Audits) are maintained in separate and uniquely named folders in ProjectWise. Folder 16.00_Design Quality Control Plan is used to store the DQCP, related forms and tools, and other QC documents not related to a specific deliverable. Folder 17.00_QC will be used to store QC documents such as check prints and comment forms. Folder 18.00_QA will be used to store deliverable-specific QA documents such as Scheduled Audits.

A hard copy of Quality Control Records may also be stored in the document control storage area in the Tarrytown Project Office.

Upon formal request of the DQCM, the Quality Records will be made available to the DQAM or Authority auditor to facilitate confirmation that appropriate Design Control Procedure(s) have been followed. Hard copies of the Quality Records may not be removed from the document control (storage area) during DQAM or Authority audits. If required, a separate folder will be created in ProjectWise where electronic copies of Quality Records can be copied to facilitate DQAM or Authority audits.

Electronic quality records will be stored in a shared accessible system such as ProjectWise or SharePoint as per the Project Document Management Plan. Hard copy quality records that are generated in remote offices away from the project office will be organized and stored according to the same systems and procedures used in the project office. Copies of these files must be provided to the project office for storage in the central project office filing system according to the Project Document Management Plan.

1.4.13 DQCP Approval and Distribution

The DQCM will develop the DQCP with input from the DQAM, Design Manager, Design Discipline Leads, and CADD Manager. The current draft and approved copies of the DQCP will reside in ProjectWise Folder 16.00. The approved DQCP will be stored in ProjectWise as both a locked Word document and pdf file. Approved changes since the previous version will be shown in track changes format in the locked Word document to facilitate identification of the changes. The file name will identify the latest approved document. Superseded documents will be moved to a "Superseded" documents folder.

Once approved, the DQCP will be made accessible to the design team and will be the basis of the QC/QA training.

1.4.14 Software Validation

Only software that is on the Approved Software List, approved and maintained by the Design Manager, can be used for Project design tasks. Approved software is either industry standard software or validated non-industry standard software. Where practical or applicable, software shall be used that has been developed under the vendor's software quality assurance plan. Documentation of software validation is maintained in ProjectWise in folder 16.11_Validated Software.

1.4.14.1 Non-industry Standard Software Programs

Computer programs (other than industry standard programs) used for design calculations shall be validated to demonstrate that the program produces valid solutions in accordance with DCPR-10 Computer Software. Changes to computer programs shall be controlled so that they are verified and approved by individuals authorized by the Design Manager. Once validated, checking of the input will be conducted in accordance with DCPR-06 Checking Input to Computer Programs. Design Team firms may have an alternate equivalent validation procedure. In this case the alternate procedure will be maintained in ProjectWise and accompany the associated validation.

1.4.14.2 Industry Standard Software Programs

The Design Manager will approve the list of Industry Standard design software prior to its use. A list of approved design software shall be maintained in DCPR-10 Computer Software. Industry Standard software does not have to be independently validated by the design team prior to use on the Project. In order to verify the software performs as intended, the Checker will verify the input is correct and accurate and will perform a reasonableness check of the output in accordance with DCPR-06 Checking Input to Computer Programs. The Checker will also check all supporting work, such as diagrams and input assumptions. An Independent Analytical Check is also conducted in accordance with DCPR-04

Independent Analytical Check (IAC) for critical structural members. Bridges will be load rated and the load rating checked in accordance with DCPR-03 Checking Calculations.

1.4.15 Identification of Document Status

The status of a drawing, report or study will be indicated in a revision block. The status of a Specification will be indicated in the footer with the same type of information shown in a revision block of a drawing; please refer to DCPR-07 Checking Specifications and Special Provisions for additional information on tracking the status of specifications. Table 1.4.15-1 summarizes the alphanumeric symbology for each phase of review and submittal. Example Specification footers are also shown below.

During the internal QC sequence of reviews, the revision designation is a letter-number combination. The letter indicates the phase of design (A = Definitive, B = Interim, C = Final) and the number indicates the review iteration for that phase (beginning with 0). If a package is revised based on review comments, the revised documents are noted with the next number in the sequence. Packages that are released for simultaneous reviews (e.g. IDR and CR) receive the same revision symbol. Once the internal QC review process is complete, the numeric portion of the symbol is dropped and the package is submitted with just the letter designation.

If needed due to a resubmittal of pre-RFC documents, the revision identification adds a letter beginning with 'A'. For example, a resubmittal of the Interim Review package may be identified as "BA".

Packages issued after the Readiness For Construction Review will be designated using numbers starting with zero. Any subsequent revised submittals are numbered 1, then 2, etc. See Section 1.4.16 for more information.

DATE	DESCRIPTION	BY	SYM	Typical	Facilities Temp & Demo	Facilities Permanent
MM/DD/YY	"Design Package ID" Issued for Informal Concept Review	ABC	W			
MM/DD/YY	"Design Package ID" Issued for First Concept Review	ABC	X			
MM/DD/YY	"Design Package ID" Ready for Second Concept Detailed Check→CR→IDR→QCR	ABC	Y0→Y1→etc.			
MM/DD/YY	"Design Package ID" Issued for Second Concept Review	ABC	Y			
MM/DD/YY	"Design Package ID" Issued for Preferred Concept Review	ABC	Z			
MM/DD/YY	"Design Package ID" Ready for Definitive Design Detailed Check→CR→IDR→QCR	ABC	A0→A1→etc			
MM/DD/YY	"Design Package ID" Issued for Definitive Design Review	ABC	A			
MM/DD/YY	"Design Package ID" Ready for Interim Design Detailed Check→CR→IDR→QCR	ABC	B0→B1→etc.			
MM/DD/YY	"Design Package ID" Issued for Interim Design Review	ABC	B			
MM/DD/YY	"Design Package ID" Ready for Final Design Detailed Check→CR→IDR→QCR	ABC	C0→C1→etc.			
MM/DD/YY	"Design Package ID" Issued for Final Design Review	ABC	C			
MM/DD/YY	"Design Package ID" Ready for Early Construction Start Design Detailed Check→CR→IDR→QCR	ABC	E0→E1→etc.			
MM/DD/YY	"Design Package ID" Issued for Early Construction Start Design Review	ABC	E			
MM/DD/YY	"Design Package ID" Issued as RFC	ABC	0			

Table 1.4.15-1 – Revision Symbology

1.4.16 Master List of Currently Effective Issued as Readiness For Construction Documents

The Project Document Management Plan will address the process of developing a master list of currently effective Issued as Readiness for Construction documents to reflect approved original design and approved design changes. A hard copy of all documents Issued as Readiness for Construction will be maintained in document control. This set will include both current and superseded documents based on the master list of current documents.

When a drawing, report or study is Issued as Readiness for Construction, the revision letters are removed from the revision block, the Professional Seal is affixed and the revision block identifies the document as Revision 0, Issued for Readiness for Construction. Previous issues of a specification need not be shown, i.e., only the current status is required. If a document is revised after it is Issued as Readiness for Construction, the document is identified numerically starting with the number "1". A drawing or Specification section, for example, added to a design package that has been previously Issued as Readiness for Construction is identified as revision "0". Revisions to that document are identified by the next number for that sheet or specification section. For additional information refer to DCPR-09 Revisions to Readiness For Construction Documents.

Once the Revision block is full, only the last four entries need to be shown.

Tappan Zee Hudson River Crossing Project	03 80 00 - 250	June 12, 2013
Pre-Interim CR, IDR, QCR	CONCRETE CUTTING AND BORING	"Design Pkg #", Rev. A

Early Construction Specification Footer Example

Tappan Zee Hudson River Crossing Project	03 80 00 - 250	June 12, 2013
RFC Submittal	CONCRETE CUTTING AND BORING	"Design Pkg #", Rev. C

Final Design Specification Footer Example

1.4.17 Planning of QA and QC Activities

The Design Team uses a Design Schedule to identify Project deliverables and their timing. The schedule indicates durations for QA and QC Activities. The DDLs initiate the QC procedures according to the start dates in the schedule in order to provide the complete duration for each review phase. These reviews are to be completed prior to the DQCM Review of QC documentation.

1.4.18 Subconsultant Selection, Control of Quality and Submittals

The Design Team was formed during the qualifications phase of the Project. This section is intended to discuss the process for adding subconsultants, if any, to the Design Team since the notice of award. Subconsultants are generally added to a design team based on historical performance of intended services. This includes both technical capabilities and adherence to the design quality processes and procedures. A meeting with the proposed subconsultant may occur to discuss the Project requirements and qualifications of the subconsultant prior to selection. A project principal selects the subconsultant based on the meeting, any qualifications provided, input from other member of the Design Team and/or judgment. As discussed in Section 1.8, all subconsultants are required to use the Project DQCP and staff assigned to perform design QC Activities will be trained in the QC process and procedures.

The subconsultant is responsible for the quality of design documents produced for this Project. Verification of quality may occur through several means including:

- TWG meetings;
- Informal coordination with other Design Team members;
- Checking and Review processes;
- Review of QC Documentation by the Authority, DQCM and/or DQAM;
- Periodic audits conducted by the Authority, DQCM and/or DQAM; and/or
- Design Reviews.

QA of subconsultants' design is controlled by the DQAP. Documents generated during the Checking and Review processes, Review of QC Documentation, and Periodic Audits will be retained as Quality Records. If comments generated by the Authority or other stakeholders are not captured through the use of a data base, then the comment forms will be retained as a Quality Record.

1.5 Design Quality Control Program (QC Processes and Procedures)

The DQCM has established and documented the Design Control Procedures (DCPR) in Appendix B of this DQCP. These procedures include the processes necessary for the DQCM to control the quality of the design and to meet the requirements of the Contract Documents at each stage of design development. The DCPRs document the QC procedures in a manner that records the depth of the review performed. The QC documents will be retained as Quality Records. The QC processes apply to the Design Team and define an auditable process that can be recognized on each design document sheet as showing QC has taken place. Internal design QA is addressed in DCPR-13. Independent design QA is addressed in the DQAP. Because of the variability of the design submittals across disciplines, the level of checking and reviews will be determined on a submittal-by-submittal basis. The DM, DQCM and DDL will jointly agree to the required QC procedures. The QC process identified for a specific submittal will be documented via a Design Development and QC Process Documentation form found in Appendix B. The Design Development and QC Process Documentation form will become part of the QC Records. The Design Discipline Leads will be responsible for implementing the QC procedures. The Detailed Check and Independent Design Checks are conducted and documented by the design staff working under the direction of the DM to enable the DM and DQAM to certify to the Design-Builder and to the Agencies the design satisfies the Contract requirements, including:

1. Accuracy;
2. Adequacy;
3. Conformance to standards of practice;
4. Compliance with codes and standards;
5. Maintenance requirements;
6. Cost effectiveness;
7. Quality; and,
8. Fitness for purpose and/or function as specified and/or implied in the Contract.

The title sheet of Readiness For Construction Plans will include the signature of the DM and DQAM to certify the design meets the Contract requirements.

1.5.1 Detailed Checks

Checking of documents is an internal process within the design team that consists of a color-coded markup detailed check, as detailed in the DCPRs. The Checker will perform calculation, drawing, or report checking, for examples. The Document Checker shall be independent of the Document Originator and

shall have the appropriate qualifications to perform the work being checked. The Document Checker shall be familiar with the Project requirements, the DQCP, and the Contract. The intent is to provide a consistent process for verifying the accuracy and completeness of the document, and for verifying and documenting corrections and/or changes that have been made. A consistent approach promotes uniform quality control among Design Team members.

Design checklists included in the NYSDOT *Bridge Manual*, Appendices 3 and 14, or referenced by the NYSTA *Structures Design Manual*, Appendix E will be used as part of the QC documentation.

1.5.2 Independent Design Checks

Independent Design Checks are conducted by senior engineers not involved in the production of the design being reviewed and who have qualifications and experience equal to or greater than qualifications and experience of the as the Responsible Engineer or Responsible Architect for the design being checked. Independent Design Checks shall be recorded and retained as Quality Records.

Independent Design Checks are comprised of Independent Design Assessment (also referred to as a Quality Control Review) and/or Independent Analytical Checks.

Independent Design Checks are augmented by Constructability Reviews and Interdisciplinary Reviews. The CR, IDR and QCR may be conducted concurrently. Table 1.5.1 depicts the areas to be considered by the Constructability Review, Interdisciplinary Review and the Quality Control Review. Reviews will be used to verify the Project's usability, reliability, maintainability, availability, and operability, along with safety, cost, and aesthetics. Reviews will also address environmental impacts, community impacts, and similar concerns.

The DQCM shall verify that independent design checks of permanent components, major temporary components, and effects of temporary components on the permanent components are completed during the Review of QC Documentation. Independent design checks shall comprise design assessments and analytical checks as further described below. Figure 1.5.2-1 illustrates the design quality control checking and review processes.

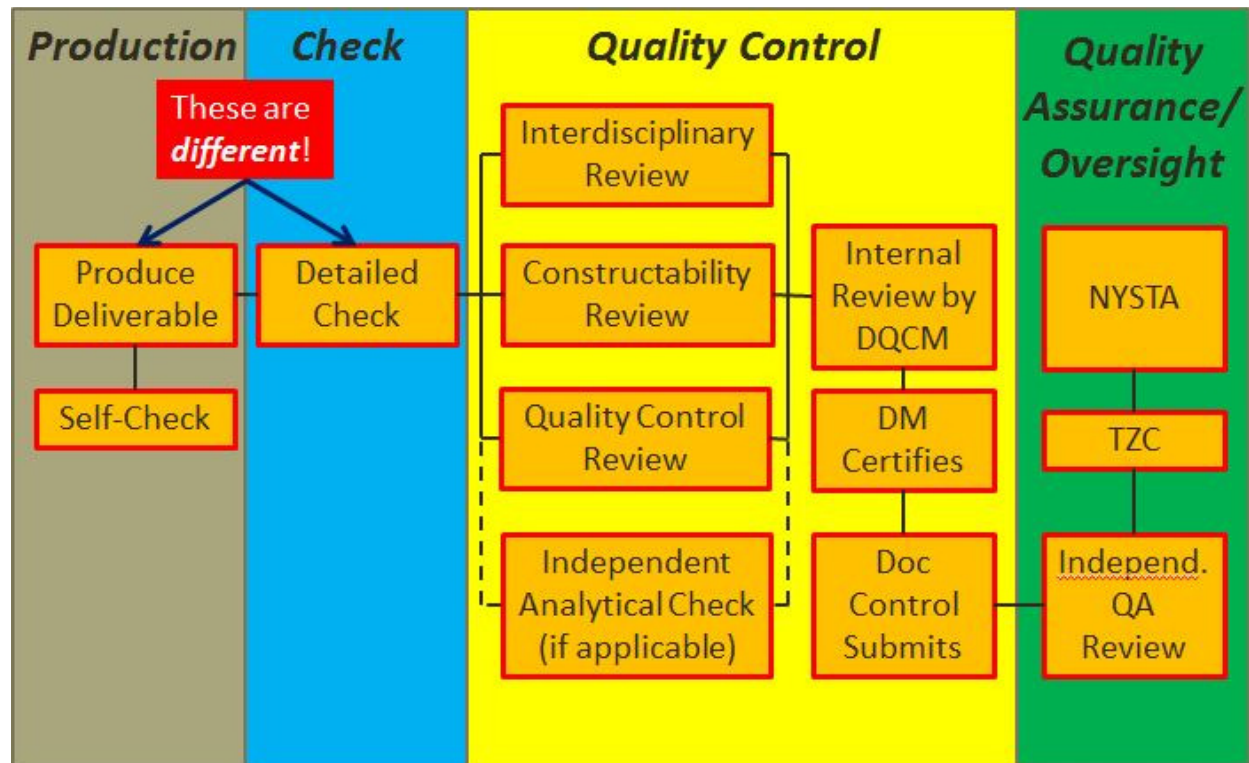


Figure 1.5.2-1 Design Quality Control Checking and Review Processes

1.5.3 Independent Design Assessments (A.K.A. Quality Control Reviews)

The IDA (QCR) is an internal review within the discipline team for design approach, suitability, conformance with clients design criteria, standards, and Project requirements, and to ensure that good engineering practice was followed. QCRs include the review of general compliance with the requirements of the contract, taking into account the proposed methods of construction. The QCR will be initiated by the Discipline Design Lead and will be performed by another senior engineer qualified in the discipline who has not participated in the production of the design or plan details. QCRs are conducted by the discipline or entity most appropriate to perform the review. The QCR is described in DCPR-12.

1.5.4 Constructability Review (CR)

The Constructability Review (CR) is an opportunity for the Design-Builder to provide formal constructability review comment to the Design Team. Real-time coordination will occur at periodic design meetings. The CR is described in DCPR-11.

1.5.5 Interdisciplinary Review (IDR)

The Interdisciplinary Review (IDR) is a review to promote and document the coordination between the design discipline teams. The Design Discipline Leads will jointly review the documents for interferences, compatibility between design disciplines, completeness, and will resolve conflicts and suggest improvements based on sound engineering practices. The IDR is described in DCPR-11.

	Constructability Review (CR)	Interdisciplinary Review (IDR)	Quality Control Review (QCR)
Loads			X
Codes and standards			X
Methods of analysis			X
Computer software and its validation (1)			X
Interface requirements		X	X
Maintenance requirements			X
Materials and Material properties	X		X
Durability requirements	X		X
Fatigue performance			X
Hydrology		X	X
Design flows			X

(1) Software validation is covered in section 1.4.14

Table 1.5.5 Areas Considered During Reviews

1.5.6 Independent Analytical Checks

The design analytical check will be conducted using separate calculations (and without reference to Originator's calculations) to establish the structural adequacy and integrity of critical structural members. This shall include:

1. Structural geometry and modeling;
2. Material properties;
3. Member properties;
4. Loading intensities; and,
5. Structural boundary conditions.

The process for conducting an Independent Analytical Check is described in DCPR-04.

1.5.7 Design Quality Process and Timing

Design Quality Process and Timing for an Early Construction Start, Final Design and Facilities Design Units are shown in the example revision blocks in Section 1.4.15. A matrix of submittals and anticipated QC Activities is used to track the status of each QC activity. . This matrix may be used to develop submittal-specific QC Activities.

1.5.8 Design Quality Control Procedures

The procedures described in Appendix B identify the overall process, guidelines, requirements, and documentation for each Quality Control Procedure to be followed in developing the Design deliverables.

1.5.9 Check Print Stamp

Figure 1.5.9-1 is an example of a check print stamp that will be used for Detailed Checking on the Project.

First Page Only: Design Package No. or Description _____	
No. _____	Date _____
CHECK PRINT	
Dwg. Only: Checked against calcs. and calc. check confirmed by _____ Date _____	
Originator _____	Date _____
Checker _____	Date _____
Backchecker _____	Date _____
Updater _____	Date _____
Rechecker _____	Date _____

Figure 1.5.9-1 Check Print Stamp Example

The following describes the check print stamp protocol.

- The Checker and Rechecker must be independent from the Originator, Backchecker and Updater.
- The Checker and Rechecker do not have to be the same person, but it is preferred.
- Originator, Checker and Backchecker are always required. Updater and Rechecker are required based on Checker's red lines.

1.5.10 QC Color Coding

The same color coding will be used for documenting the QC process on all design documents. This will simplify the process and facilitate the checking. See the relevant DCPR procedure for the color coding process.

1.5.11 Mapping of RFP Terminology to DQCP Terminology

Several review names used in the DQCP are based on existing processes familiar to the Design Team. This was done to reduce confusion and maintain the consistency understood by the team. Table 1.5.11 maps the DQCP review terminology to the related requirements in the RFP.

Table 1.5.11 – Map of DB 111 Language to DQCP Language

DB 111 Language		DQCP Language			
Design Checks (DB 111-11.1) "...a check of the calculations, specifications, and drawings to confirm the correctness of the design...must be comprehensive...Design checklists..."		Detailed Checks (DQCP 1.5.1) "Detailed Check - A comprehensive documented check of the calculations, specifications, and drawings to confirm the correctness of the design." <i>DCPR-02 Checking Reports and Studies</i> <i>DCPR-03 Checking Calculations</i> <i>DCPR-05 Checking Drawings</i> <i>DCPR-06 Checking Input to Computer Programs</i> <i>DCPR-07 Checking Specifications and Special Provisions</i> <i>DCPR-08 Checking Spreadsheets</i>			
Independent Design Checks (DB 111-11.2) "...conducted by senior engineers not involved in the production of the design being reviewed...shall comprise design assessment and analytical checks as specified in DB 111-11.3 and DB 111-11.4..."		Independent Design Checks (DQCP 1.5.2) "...comprised of Independent Design Assessment (also referred to as a Quality Control Review) and/or Independent Analytical Checks...are augmented by Constructability Reviews and Interdisciplinary Reviews..."			
Design Assessment (DB 111-11.3) "...review of general compliance with the requirements of the Contract..."	Analytical Check (DB 111-11.4) "...using separate calculations (and without reference to the Designer's calculations) to establish the structural adequacy and integrity of critical structural members..."	Independent Design Assessment (A.K.A. Quality Control Reviews) (DQCP 1.5.3 and DCPR-12 Quality Control Reviews) "...an internal review within the discipline team for design approach, suitability, conformance with client's design criteria, standards, and project requirements, and to ensure that good engineering practice was followed. QCRs include the review of general compliance with the requirements of the contract..."	Constructability Review (DQCP 1.5.4 and DCPR-11 CR and IDR) "...an opportunity for the Design-Builder to provide formal written constructability review comments to the Design Team."	Interdisciplinary Review (DQCP 1.5.5 and DCPR-11 CR and IDR) "...a review to promote and document the coordination between the design discipline teams."	Analytical Check (DQCP 1.5.6 and DCPR-04) "...will be conducted using separate calculations (and without reference to Originator's calculations) to establish the structural adequacy and integrity of critical structural members."

1.6 Internal Design Quality Assurance Processes

The DQCM has established and documented the internal design QA procedure in DCPR-13. This procedure includes the process necessary for the DQCM to confirm that the QC documentation is in substantial compliance with the QC procedures and the design meets the requirements of the Contract Documents prior to submitting the document(s) to the DQAM to initiate Independent design QA activities.. Internal Design Quality Assurance personnel shall not participate in any Design Quality Control Activities and shall be independent of the Design Quality Control personnel. Implementation of Internal Design QA activities are supplemental to the role of the QAEF and do not negate or replace any of the QAEF activities or responsibilities.

The DQCM is also responsible to establish, document, and implement the methods and procedures by which the design Work shall be certified as complying with the requirements of the Contract Documents. The independent DQAM is responsible to oversee, manage, certify and perform QA activities as detailed in the DQAP. Refer to the DQAP for additional detail.

The Design Team is required to follow the QA/QC procedures established and documented in this DQCP. Subconsultants involved in the QC process will be trained by the DQCM and training records will be maintained in ProjectWise. The DQCM will perform a Review of QC Documentation as described in DCPR-13 to verify subconsultants meet, implement, document, and maintain the QMS requirements.

The type and extent of control of subconsultants exercised by the DQCM is described in DCPR-13. The DQCM will perform a Review of QC Documentation of subconsultant design submittals to confirm that subconsultants have implemented the QC procedures described in this DQCP. The DQCM will determine, based on demonstrated capability and performance, whether additional audits or surveillances are required to confirm subconsultant understanding of and compliance with this DQCP.

1.6.1 Design Quality Assurance

The DCPRs provided in this DQCP shall apply to the elements of design. DCPR-10 includes a list of computer programs that have been approved by the DM to develop and check designs. Computer programs may be added to the list with the approval of the DM.

The Design Team will use Form DUS to identify Project Design Unit deliverables and their timing. Checks and Reviews will be scheduled by the DDL based on the timing of deliverables detailed in Form DUS. The DDLs will initiate and substantially complete (i.e., a QC package may be delivered to the DQCM) the QC procedures prior to the DQCM Review of QC Documentation.

1.6.2 Design Quality Assurance Auditing (Scheduled Audits)

The DQCM will perform scheduled audits on the QC Activities of each Design Submittal. This process is generally considered a "Review of QC Documentation". The DQCM will perform a sampling of QC documentation to confirm the checking and review processes detailed in the DCPRs are effectively implemented. The intent of these audits is to verify through objective evidence that the applicable DCPRs were followed in the production of the deliverable. This scheduled audit process is detailed in DCPR-13. Form DCPR-13A will be used to document the audit.

1.6.3 Design Inputs

The DM and DDLs will identify and create a list of the statutory and regulatory requirements and Project requirements (design inputs) relevant to the Project. This will include design basis documents, Agency manuals, previous reports, and other reference material. The list will be stored in ProjectWise folder 05.00_Project_Data_Reference_Data accessible to all Design Team staff. The Design Team will be notified of the location of the list. The list will be version controlled. This process will determine what information is needed and the available sources for information, provide for review of the pertinent

available data, assures the management staff that there is sufficient information to carry out the design, and facilitate resolution with the Agencies and other appropriate authorities any actual or apparent conflicts or inconsistencies in the information so gathered. Additional inputs will be reviewed for technical accuracy, completeness and suitability by the appropriate DDL prior to utilization for design. Once revisions are approved by the DM, the list will be revised and the version control updated. The Design Team will then be notified via e-mail of the update. The information, sources, and decisions taken shall be documented and treated as a Quality Record.

1.6.4 Design Outputs

The Design Team will produce design Plans, Reports, Studies, and Specifications to facilitate verification, validation and in accordance with the Project requirements. These design products will be maintained in ProjectWise. The design documents will be reviewed by the Design Team and a construction team representative prior to RFC. See DCPR-11 and DCPR-12 for additional description of the CR, IDR and QCR.

1.6.5 Control of Documents and Data

Documents of external origin such as standards and Agencies' plans will be maintained in document control and, if practical or received electronically, will reside in ProjectWise. Unless specifically requested by the entity that provided the documents, hard copy documents will not be returned. The DM will review external documents for adequacy prior to making available to the Design Team. Any ambiguity and/or deficiency will be brought to the attention of the appropriate Agency by the DM for necessary action. The DM will approve by causing these documents to be uploaded to ProjectWise. Once uploaded, the DM will notify the appropriate DDLs of receipt and the location of the documents.

Version control of design documents is addressed in sections 1.4.15.

Contracts, pdf files of design documents, design QC records, and DQCP shall be stored in ProjectWise. A hard copy of the prime and subconsultant contracts will be maintain by the DM. Hard copies of the pdf files of design documents, design QC records, and DQCP will be stored in Document Control.

Final computer files used for design development (computer runs) will be saved in designated folders in ProjectWise.

1.6.5.1 Document and Data Approval and Issue

A master list of management plans that affect the Design Team will be maintained by document control. Document control will send a notice to the DM and DDLs when the list is updated. Document control will verify with TZC JV document control periodically to be proactive in updating the list. Documentation of the inquiry and/or update sent to the DM and DDL will be show on the list or other method as described in the Project Document Management Plan. The following is a list of the types of plans that will be tracked on a periodic basis to preclude the use of invalid and/or obsolete documents:

- Project Management Plan;
- Quality Plan;
- DQCP;
- Document Control Plan;
- Environmental Compliance and Mitigation Plan,
- Safety Plan;
- Work Zone Traffic Control Plan.
- DBE Plan;
- Workforce Participation Plan;
- Site Security Plan;

- Risk Management Plan;
- Information Technology Plan; and,
- Public Involvement Plan (PIP) Support plan.

The DQCM will conduct a periodic visual surveillance of the Design Team work area to assess whether invalid and/or obsolete Plans are being used and to guard against unintended use will promptly remove any that are found. The DQCM may use the List of Management Plan Tracking to facilitate the surveillance.

Prior to submitting a design package to the Authority, the DM will sign a cover page for the submittal indicating approval.

The DQCP will be version controlled to and signed by the DQAM to provide for proper authorization. The DQCM, through the DQAM and DM will distribute updates to the Design Team. Outdated and/or obsolete versions of the DQCP will be moved to a superseded folder. The current version of the DQCP will reside in ProjectWise with both track changes from the previous version shown and as a clean document at the following link: [16.01 DQCP](#).

[pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control Plan\16.01_DQCP\](#)

1.7 Design Quality Control Improvement

The DQCM will be responsible to establish, document, and implement a program for quality improvement. The DQCM will use corrective and preventive actions to facilitate, in part, continuous improvement. Feedback from the design team, Design-Builder or management will be used to identify opportunities for improvement. When opportunities for improvement are identified, formal and informal meetings may be used to communicate such opportunities. When preventive action e-mails are used, these e-mails will be retained in ProjectWise. If changes to the DQCP are required, the DQCM will initiate the changes, seek informal acceptance of the change by the Authority, and communicate the change to the design team for implementation.

The DQCM shall establish and maintain documented procedures for planning and implementing periodic audits to measure the effectiveness of the DQCP and identify quality improvement opportunities (DCPR-15). The DQCM shall schedule and perform internal design quality audits on the basis of the status and importance of the activity to be audited as well as the Authorities auditing efforts and the goals of the Project. Personnel who are assigned to audit activities shall not have direct quality responsibilities for the respective activities they audit. The results of the audits shall be recorded and reviewed with the personnel having responsibility in the area audited not later than 3 Working Days following completion of the audit.

The DQCM or project management personnel shall implement the necessary corrective actions to improve any deficiencies found during the audit. The DQCM's follow-up activities shall ensure the implementation and effectiveness of the corrective action taken. Corrective actions shall identify the root causes of deficiencies and shall be developed, implemented, and tracked to prevent the recurrence of future deficiencies. Corrective actions shall be monitored through review of documents, surveillance, or follow-up audits. Records of corrective actions shall be kept together with the respective audit records and submitted to the Authority upon request.

1.7.1 Corrective and Preventive Actions

The DQCM will use the Quality Audit Finding Form to address findings requiring corrective action. When required, the DQCM will investigate the root cause of the nonconformance and take step to correct the deficiency, i.e. additional targeted training. The corrective action will include follow-up to verify the steps taken have resulted in the desired outcome. The need for corrective action may be identified by the DQCM or management staff.

The DQCM, or other management staff, may identify potential QC process nonconformances or opportunities for improvement. When this occurs, the DQCM will determine a course of action and will distribute the process clarification via a "Preventive Action" e-mail to the Design Discipline Leads. Preventive Action e-mails will be stored in ProjectWise. See DCPR-15 for more information.

1.7.2 Management Review of the Quality Management System

The Design Manager and DQCM will participate in the Design-Builder's executive Management Reviews of the QMS at planned intervals, not to exceed 3 months, to ensure its continued suitability, adequacy and effectiveness in satisfying the D-B's quality policy's and objectives.

1.7.3 Management Review Input

The input to the review related to the design shall include, as appropriate:

- Internal audit findings;
- Agencies' feedback;
- Process performance;
- Status of Corrective and Preventive Actions;
- Follow-up items from previous management reviews
- DQCP updates; and,
- Recommendations for improvements.

1.7.4 Management Review Output

Results of the Management Reviews related to the design shall include, as appropriate, decisions and directives relative to recommendations for further actions associated with changes to QC and internal QA processes, materials and resources. Records of the reviews, including meeting minutes, shall be maintained in ProjectWise at the following link: [16.12 Management Reviews](#).

[pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design_Quality_Control_Plan\16.12_Management_Reviews\](#)

1.8 Design QC and Internal QA Training

1.8.1 QC Training

The DQCM will develop and deliver QC training for use by personnel involved in design QC Activities. The training will focus on improving the competency and skill required to perform design QC Activities. The training documents will be maintained in ProjectWise in folder 16.10_QC Training and be available to all design personnel. Training will be documented through attendance forms and the attendance forms will be stored in ProjectWise. The date the training was conducted will be entered into a data base of all Design Team personnel so that the DQCM can identify personnel who require QC training. The DQCM will periodically review the database to ensure that all persons engaged in QC activities have been trained. The DQCM will conduct the QC training prior to the personnel performing the QC Activities.

When required, revisions to the training document will be shown in track changes so that the clarifications and process improvements, for example, can be easily identified. The updated version of the training document will be sent to the Design Discipline Leads for further distribution. Updates of the QC processes in the DQCP will be communicated to the design team through the Preventive Action process, a link to the revised document or through additional training if determined to be necessary by the DQCM.

Design Discipline Leads and/or the project Management Team will notify the DQCM when new persons are added to the project. The DQCM will provide prompt training, on a one-to-one basis if necessary, prior

to a new team member beginning any design QC activities. During scheduled and periodic audits, the DQCM will cross-check the names of personnel engaged in checking/review activities with the training log.

No external certification is required for Design Team personnel to perform QC Activities. However, each member of the Design Team must have completed the QC training.

1.8.2 Internal QA Training

Additional training of Internal QA personnel may also be required (for the internal Review of QC Documentation). The DQCM will provide this training. No certification is required for Design Team personnel to perform internal QA activities.

1.8.3 Comment Resolution Guidance

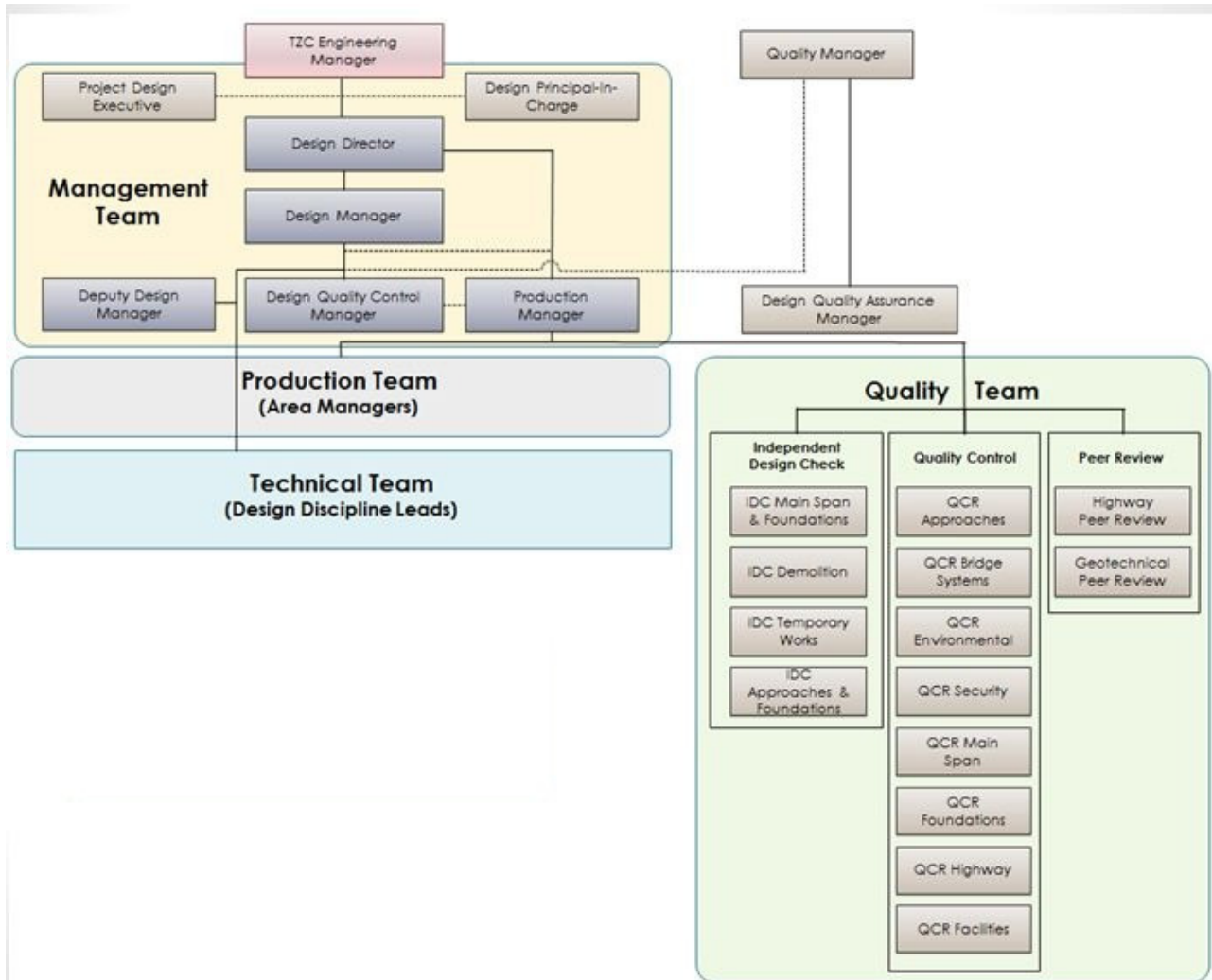
The DQCM will provide guidance to design staff that may interface with the Authority's oversight efforts (design reviews and audit process) to ensure they understand their roles and responsibilities for cooperating and responding to these design reviews and audits.

APPENDIX A

Design Quality Control Organization Chart

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Design Quality Control Organization Chart



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APPENDIX B

Design Control Procedures (DCPR)

DCPR-01	Design Quality Records
DCPR-02	Checking Reports and Studies
DCPR-03	Checking Calculations
DCPR-04	Independent Analytical Check (IAC)
DCPR-05	Checking Drawings
DCPR-06	Checking Input to Computer Programs
DCPR-07	Checking Specifications and Special Provisions
DCPR-08	Checking Spreadsheets
DCPR-09	Revisions to Readiness For Construction Documents
DCPR-10	Computer Software
DCPR-11	Constructability Review (CR) and Interdisciplinary Review (IDR)
DCPR-12	Quality Control Review (QCR)
DCPR-13	Internal Design Quality Assurance Audits
DCPR-14	As-Built Drawings
DCPR-15	Corrective and Preventive Actions
DCPR-16	Parallel Model Checking
DCPR-17	Readiness For Construction (RFC)

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1.0 PURPOSE - To provide a system for identification, collection, indexing, filing, accessing and storing or discarding all Design Quality Records.

2.0 SCOPE - This procedure applies to all quality records produced by the Design Team for this Project.

3.0 DEFINITIONS

Design Quality Record – consists of the documentation of the checking, reviews, and audits including check prints, review forms, certifications and audit checklists, as applicable.

4.0 RESPONSIBILITIES - It is the responsibility of each individual within the Design Team to ensure that the Design Quality Records that he/she generates are legible and complete.

Each Design Discipline Lead is responsible for establishing the requirements for the control and maintenance of the Design Quality Records generated within their design groups.

The Design Quality Control Manager is responsible for compiling and maintaining a Master List of Design Quality Records. The types of Design Quality Records, location, and retention period are shown in Figure DCPR-01.

5.0 PROCEDURE

5.1 Identification and Maintenance

- A. Each Design Discipline Leader has a procedure or work instruction identifying all Design Quality Records that are generated within the group.
- B. All Design Quality Records are legible, dated and identifiable to the product, person or event to which they pertain.
- C. All Design Quality Records are indexed, filed and stored to facilitate easy access.
- D. Access to Design Quality Records is controlled by the DQCM to ensure the integrity of the records while permitting access to those who need the records.
- E. Design Quality Records are identified as exhibited in Figure DCPR-01.

5.2 Storage and Maintenance

- A. Design Quality Records are stored in a suitable environment to prevent damage, deterioration and theft. The Design Quality Records will be located at the Project Office during the design phase.
- B. Design Quality Records that are filed electronically are backed up on a regular basis to secure off-site server in the case of loss due to theft or damage.

5.3 Electronic Copies of Quality Records

Electronic copies of the Design Quality Records will be created and stored on ProjectWise during the design phase of the Project.

5.4 Retention and Disposition

- A. Design Quality Records are retained in suitable storage for the period of time and location defined in Figure DCPR-01, at a minimum.
- B. Requests for access to the Design Quality Records are to be made to the DQCM during the Design Phase and Construction Phases and the DM thereafter.

6.0 FIGURES

Figure DCPR-01 Design Quality Records

Figure DCPR-01

DESIGN QUALITY RECORDS

<u>DQCP</u>	<u>Element</u>	<u>Quality Record(s)</u>	<u>Minimum Retention Period</u>	<u>Location</u>
DCPR-11 & 12	Design Validation Reviews	QC Review Forms (CR, IDR, & QCR) and Comment Sheets.	7 Years following Contract completion	HDR Project Office
DCPR-2, 3, 4, 5, 6, 7, 8, 10	Design Verification	Quality Check Prints of dwgs, calculations and software input/output, studies, reports, specifications.	2 Years following Contract completion	HDR Project Office
DCPR-9, 14	Design Changes/ Revisions	Documentation Form DCN, Plan, Spec., or other revised document.	7 Years following Contract completion	HDR Project Office
DCPR-13	Deliverable Certifications	Internal Design QA Checklist, Design Quality Assurance Manager and Design Manager Certification	7 Years following Contract completion	HDR Project Office

Subject: **DESIGN QUALITY RECORDS**

<i>Procedure No.</i>	DCPR-01
<i>Page</i>	4 of 4
<i>Revision</i>	1

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1.0 PURPOSE - To provide guidelines for preparation and checking of reports and studies.

2.0 SCOPE – Studies and reports shall be subject to the checking procedures contained within this section when this procedure is indicated on the *Design Development and QC Process Documentation* form. When required, these checking activities shall be completed prior to the deliverable to being submitted to the Authority.

3.0 DEFINITIONS

Originator/Backchecker. Originators comprise the technical staff that is directly responsible for producing the designs, calculations, studies, reports, specifications, estimates, and plans that are necessary to develop a deliverable. Originators are responsible for reviewing their own work for completeness, technical accuracy content and form prior to having such work undergo the formal quality checking process. The Originator of a document shall not rely on Checkers to uncover or resolve errors in the work product. The Originator shall work closely with the Checker to address and resolve any comments developed through the quality checking process.

Checker/Rechecker. Checkers are individuals who are directly responsible for performing a detailed suitability, concept and math check of design documents that are generated by Originators. Checkers shall have the technical knowledge and qualifications necessary to serve as the Originator for the work element being checked. The Checker of a particular design document shall not be the same individual that originated that design document. An individual can serve as both an Originator and a Checker, but not both on the same document.

Updater. Updaters are individuals directly responsible for incorporating changes to the design documents based on comments made by a Checker and agreed to by the Originator.

Check Set. The document that is provided to the Checker for checking or review.

Checker and Reviewer are used interchangeably in the DCPR.

4.0 RESPONSIBILITIES

The following personnel have the responsibilities as follows:

Originator: Responsible for creating a review document affixing the Check Print Stamp and providing the review forms; responding to comments; reaching concurrence with the Reviewer for proposed changes that will not be incorporated; and, printing revised documents (i.e., reports) for the Reviewer. The Originator shall provide the Design Package No. or description with the percent review in the top of the Check Print Stamp. If a subsequent Check Print is printed, then this information will be provided in the subsequent Check Print.

Checker/Rechecker: Responsible for checking the report or study; reaching concurrence with the Originator for proposed changes that will not be incorporated; and, verifying that all changes have been properly incorporated.

Design Discipline Lead: Responsible for assigning a Reviewer.

Updater: Responsible for incorporating the changes in the document. The Updater may be the Originator.

Reviewer: Responsible for reviewing the document and resolving comments.

5.0 PROCEDURES

5.1 Applicability

This procedure shall apply to Reports and Studies that are required to be checked based on the *Design Development and QC Process Documentation* form.

Studies and reports have unique formats and are subjective; therefore, the checking procedure for studies and reports will more closely resemble a “peer” type independent technical review. Checking of studies and reports shall be accomplished as follows.

Review of studies and reports shall be accomplished as either a marked-up hard copy or through the Word “track changes” feature as follows. If a check print 2 is required, only the affected sheets need to be printed and presented as QC documentation. When the check print 2 consists of only the affected sheets, it is the responsibility of the Originator to verify whether changes incorporated affect the pagination of the document and the accuracy of the table of contents.

5.1.1 Review by hard copy check print

1. A **copy** of the completed study or report shall be made and the Check Print Stamp shown in Figure 1.5.9-1 shall be placed on the cover. The Originator shall fill out the first line of the Check Print Stamp indicating the design package number and percent complete. The Originator shall number and date and the check print. The Originator shall initial the “**Originator**” and date the Check Print Stamp indicating the document is ready for review.
2. The Review copy is then given to the Reviewer. The Reviewer reviews the document to see that the methods, procedures, assumptions, theories, conclusions and recommendations are appropriate as well as check the structure and grammar of the document. The Reviewer will strike a Yellow highlighter across the text of each page to indicate it has been reviewed and mark all changes or corrections in Red. Numbers and calculations will be checked and highlighted in Yellow to indicate correctness. The Checker may add non-record comments or instructions to the Check Set using **blue** or a blue cloud. The Checker will initial and date the “**Checker**” box on the Check Print Stamp upon completion of the check.
3. The Review copy will be returned to the Originator for concurrence of all corrections or changes to be made. The Originator will review all changes or corrections marked in red by the Checker and place a red check mark next to each change or correction that is to be incorporated. The Backchecker will place a red “X” next to a change or correction not to be incorporated. If a change or correction is not to be incorporated, the Originator will discuss the change or correction with the Checker and attempt to reach a resolution. If agreement cannot be reached, the issue shall be brought to the Design Discipline Lead associated with the Check Set for resolution. Unresolved disagreements involving technical issues shall be resolved by the Engineer of Record. If the disagreement is resolved such that the change or correction will be incorporated, the red “X” will be changed to a red check mark. The Backchecker will then initial and date the “**Backchecker**” box on the Check Print Stamp.
4. The Updater (Originator or a delegate) will incorporate the comments and will confirm the edit, as they are incorporated, by highlighting the corrections in Yellow. The Updater will initial and date the “**Updater**” box on the Check Print Stamp when all the edits are complete. The Updater will print out the revised document.
5. A revised copy of the study or report and the quality control check copy will be provided to the Rechecker to verify the Updater incorporated the changes correctly by placing a **Green** check mark on the quality control check copy. The Rechecker will place a green check mark adjacent to edits that were agreed not to be included to indicate closure of the comment. The Rechecker verifies that all of the required steps of the checking process have been performed and

documented on the Check Print. Once the Rechecker is satisfied that all the corrections to the document have been made, the Rechecker will initial and date the **“Rechecker”** box on the Check Print Stamp.

6. The QC check copy with the completed Check Print Stamp will be filed as per the Document Control Plan as a record of the completed check.

5.1.2 Review of check print with electronic Reviewer edits

An Originator may present an electronic copy of a document to be reviewed. The check print stamp can be affixed electronically and the information in the check print stamp will be inserted using track changes so that an auditor can verify who completed the different lines on the stamp. The review process for this scenario is similar to the process described in section 4.1.1, including completing the Check Print Stamp, whereby the Reviewer inserts proposed changes in red using track changes instead of hand writing them, if any. The Reviewer may use yellow to highlight pages that have been checked and did not generate comments. Non-record comments will be inserted with blue text (preferably in a text box) or in a blue cloud. The Backchecker will examine the document to determine whether the Reviewer proposed any changes.

If the Reviewer did not propose any changes, then the Originator/Backchecker prints or saves the check print and clean print and provides them to the DQCM during the Review of QC Documentation. If the Reviewer proposed any changes, the Originator may either process the check print electronically or print the check print and continue the process as a hard copy. If the process is finalized as a hard copy, the Originator/Backchecker will proceed as in step 3 in section 5.1.1. If the process is finalized electronically, then the text of the check print needs to be saved as the clean print and the edits accepted. The Originator/Backchecker prints or saves the check print and clean print and provides them to the Rechecker for verification. The check print and clean print are also provided to the DQCM during the Review of QC Documentation (See DCPR-13).

5.1.3 Review of revised document with electronic edits by the Originator

As the design progresses, a text document may be updated by the Originator. In this scenario, it is easiest to update the document using track changes so that the updates from the previously checked version are readily identified by the Reviewer. Previously checked information does not need to be rechecked.

The Originator presents an electronic copy of a document to be reviewed. The check print stamp can be affixed electronically and the information in the check print stamp will be inserted using track changes so that an auditor can verify who completed the different lines on the stamp. The Reviewer may use yellow to highlight pages that have been checked and did not generate comments. Non-record comments will be inserted with blue text (preferably in a text box) or in a blue cloud. The Backchecker will examine the document to determine whether the Reviewer proposed any changes.

If the Reviewer did not propose any changes, then the Originator/Backchecker prints or saves the check print and clean print and provides them to the DQCM during the Review of QC Documentation. If the Reviewer proposes any changes, then the changes should be typed in track changes to facilitate acceptance by the Originator/Backchecker. The Originator may either process the check print electronically or print the check print and continue the process as a hard copy. If the process is finalized as a hard copy, the Originator/Backchecker will proceed as in step 3 in section 5.1.1. If the process is finalized electronically, then the text of the check print needs to be saved as the clean print and the edits accepted. The Originator/Backchecker prints or saves the check print and clean print and provides them to the Rechecker for verification. The check print and clean print are also provided to the DQCM during the Review of QC Documentation (see DCPR-13).

5.2 Appendices in Reports and Studies

Appendices in reports and studies may contain a large volume of calculations and/or computer input/output. To facilitate identifying the Originator and Checker, the appendix cover sheet can identify the Originator and Date and the Checker and Date for the entire appendix. This replaces the requirement to provide this information on each sheet in the appendix as required by *DCPR-03 Calculation Checking*.

5.3 Revision Blocks

The revision designation in the revision block for reports and studies will generally be alphabetic prior to acceptance or approval, as applicable, by the Authority. This will provide for the tracking the incorporation of comments. When the document is submitted for acceptance or approval, it will be submitted as a "Revision 0". Revisions thereafter will be incremented starting with the number 1.

6.0 FORMS

None

7.0 FIGURES

None

1.0 PURPOSE - To provide guidelines for preparation and checking of engineering calculations including bridge load ratings.

2.0 SCOPE - This procedure identifies the requirements and guidelines for Design Calculations checking. The intent is to provide a consistent process for verifying the accuracy and completeness of Design Calculations, and for verifying and documenting corrections and/or changes that have been made. This procedure typically applies to calculations done by hand or in other hardcopy form. See DCPR-06 for additional procedures related to checking calculations generated by computer programs. See DCPR-08 for additional procedures related to checking calculations generated by spreadsheets.

2.1 DEFINITIONS

Calculation – a mathematical process requiring the manual or electronic use of numerical data via formulas, equations and/or computer programs to achieve a numerical solution or interpretation of that data.

2.2 RESPONSIBILITIES

Calculation Originator – the individual who develops the original calculations.

Calculation Checker – an individual possessing necessary qualifications and assigned by the Design Manager or Design Lead to perform checking of the mathematical computations of a calculation. The Calculation Checker shall be independent of the Calculation Originator.

3.0 PROCEDURES

3.1 Applicability

This procedure shall apply to Design Calculations that are required to be checked based on the *Design Development and QC Process Documentation* form.

3.2 Design Calculations

3.2.1 Hand Calculations

Hand calculations will be checked using the Detail Check Method. Both the Calculation Originator and Calculation Checker will initial and date each sheet.

3.2.2 Bridge Load Rating

A bridge load rating will be performed for each bridge according to the NYSDOT EI 05-034 Level 1 rating, and the *AASHTO Manual for Bridge Evaluation*. Bridge load ratings will be checked by the Detail Check Method. Prior to the RFC submittal, a licensed professional engineer in the state of New York will sign and seal each bridge load rating. The signed and sealed load rating will be provided to the Design Quality Control Manager for review during the Review of QC Documentation and be submitted to the Authority as part of the RFC submittal.

3.3 Detail Check Method

The Detail Check Method involves a complete check by the Calculation Checker of the calculations, associated means and methods, and resulting final outcome developed by the Calculation Originator.

The Design Manager or Design Discipline Leader will determine the point at which work has progressed sufficiently that checking can begin on a completed portion of the calculations. Calculation checking shall be performed as soon as practicable so that follow-on work is not negatively impacted. The Design Manager or Design Discipline Leader shall assign a qualified individual as the Calculation Checker. Checking shall be done by an individual who is not the Calculation Originator.

The Detail Check Method is conducted by using the Yellow Line Method (performed on copies of the calculation sheets).

The Calculation Checker shall review, check and agree with:

- assumptions,
- methods (standard or client specific),
- code requirements,
- formulas and mathematical hand computations,
- appropriate use of computer programs,
- spreadsheet accuracy,
- validity of computer models used for analysis,
- accuracy of computer program input, and
- resulting outcome, including sketches, graphs and figures.

The Design Manager, Design Discipline Leader or Checker shall verify that any Project changes that may have occurred before, during and/or after the calculation checking process have been incorporated into the Final Design Calculations and ultimately into the final deliverables, and that appropriate back-checking has been performed.

3.4 Yellow Line Method

In the Yellow Line Method, checking is performed on copies of the original calculation sheets referred to as a "Check Set" of calculations. The original calculation sheets are kept by the Calculation Originator. Checking is performed with color coding to identify the various stages of the checking process.

The color coding scheme is as follows:

- **Yellow** is used by the Calculation Checker to indicate agreement.
- **Red** is used by the Calculation Checker to indicate corrections and additions.
- **Red** is also used by the Calculation Originator to indicate approval (✓) or disapproval (x) of Calculation Checker's corrections and additions (back check).
- **Yellow** is used by the Calculation Updater to indicate that changes to the original calculation sheet have been made.
- **Green** checkmark (✓) is used by the Calculation Rechecker to verify that the correct change has been made to the original calculation sheet.
- **Blue or blue cloud** is used for non-record comments or instructions.

Once the Calculation Checker has completed checking a specified set of calculations, the Calculation Checker shall enter his/her first initial, full last name and date in the "Checked By" field of the Calculation Cover Sheet and shall give the Check Set to the Calculation Originator for review and concurrence with all marked-up items.

The Calculation Originator shall then backcheck the Calculation Checker's comments and additions.

After all disagreements have been resolved the Calculation Originator will correct the items on the original calculation sheets and will place a yellow line or highlight through the red marked-up comments on the Check Set. The Calculation Originator will return the revised original calculations and the Check Set to the Calculation Checker. The Calculation Checker will verify that each marked-up item has been correctly

changed on the original calculation sheets and will place a green checkmark (✓) on the Check Set adjacent to each marked-up comment to indicate final concurrence. When agreement is reached with all items, the Calculation Checker shall place his/her first initial and full last name in the "Verified By" field of the calculation cover sheet.

Once a calculation has been checked, it does not need to be checked again unless changes to the calculation have been made.

3.5 Resolution of Disagreements

The Calculation Originator and Calculation Checker shall endeavor to resolve any disagreements. If agreement cannot be reached between the Calculation Originator and Calculation Checker, the issue shall be brought to the attention of the Design Manager who shall contact the Discipline Lead (if not the Calculation Originator) or the next level of supervisor or Engineer or Architect of Record (if applicable) for resolution. If agreement on the proposed resolution is still not reached, then the appropriate qualified company executive (identified by the Design Manager) shall determine resolution of the disagreement.

Upon resolution in favor of the Originator, the Checker, as the Verifier, shall place a green check mark next to the Originator's red "X" mark indicating acceptance of the Originator's objection and that the edit was not made. If the resolution has been settled in favor of the Checker, the Originator shall place a single strikethrough through the red "X" and provide a red check mark next to the proposed edit.

3.6 Revisions to Checked Calculations

When a calculation is revised, the originator of the revision shall void the original calculation by recording "SUPERSEDED" on the cover sheet and identifying the superseding calculation. A new calculation cover sheet shall be added to the revised calculation with the appropriate revision number and likewise identifying the superseded calculation. The revised calculation shall then be checked in accordance with these procedures.

3.7 Validated Calculations

Calculations for a specific design element may appear unchanged in multiple calculation packages (deck design, for example). In order to reduce the volume of paper, a fully checked set of calculations and the associated clean set of calculations will reside in the ProjectWise as evidence of prior checking and can be referenced during the checking process. Once a set of calculations has been fully checked using the Detail Check method, it can be considered "Validated" and does not need to be checked each time it is used. When a validated set of calculations is used in a subsequent submittal, the Originator will affix a Check Print Stamp to the cover page of that section of the calculations, indicate the Check Print number and date, initial and date the "Originator" line indicating it is ready for checking, and write "Validated" in blue on the calculation cover page. The Checker will verify the calculation set is validated by confirming the validated set resides in the ProjectWise and initial and date the Check Print Stamp. A copy of the original calculations will be included in the submittal calculations.

Validated Calculations will be stored at the following link: [16.07 Validated Calculations](#).

pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control
Plan\16.07_Validated Calculations\

4.0 FORMS

Form DCPR-03A Calculation Cover Sheet

5.0 REFERENCES

DCPR-04 Independent Analytical Check (IAC)
DCPR-05 Checking Drawings
DCPR-06 Checking Input to Computer Programs
DCPR-08 Spreadsheet Checking

6.0 FIGURES

Figure 1.5.9-1 Check Print Stamp

1.0 PURPOSE - To provide guidelines for preparation of an Independent Analytical Check (IAC) using separate calculations to establish structural adequacy and integrity of critical structural members.

2.0 SCOPE - This procedure identifies the requirements and guidelines for performing an IAC. The intent is to provide a consistent process for performing the IAC, and for verifying and documenting corrections and/or changes that have been made.

3.0 DEFINITIONS

Independent Analytical Checker – an individual possessing necessary qualifications and assigned by the DM or DDL to perform the IAC. The Independent Analytical Checker shall be independent of the Design Originator.

Design Originator – the individual who develops the original design.

Critical Structural Member - Main load-carrying member that would have a significant negative impact on the integrity of the structural system if its capacity or function was compromised.

4.0 RESPONSIBILITIES:

The following personnel have the responsibilities as follows:

Design Originator: Responsible for creating the design; responding to comments; reaching concurrence with the Independent Analytical Checker for proposed changes that will not be incorporated; and, printing revised documents for the Reviewer. The Design Originator shall update the calculations and drawings based on agreed to comments from the Independent Analytical Checker.

Independent Analytical Checker: Responsible for performing the Independent Analytical Check, reaching concurrence with the Design Originator for proposed changes that will not be incorporated; and, verifying that all changes have been properly incorporated into the calculations and drawings.

Design Discipline Lead: Responsible for assigning an Independent Analytical Checker.

5.0 PROCEDURES

5.1 Applicability

This procedure shall apply to Independent Analytical Checks that are required to be performed based on the *Design Development and QC Process Documentation* form.

5.2 Independent Analytical Check Method

The Independent Analytical Check Method involves the development of a completely separate set of calculations by the Independent Analytical Checker to establish structural adequacy and integrity of critical structural members and to verify that the Design Originator's outcome reasonably satisfies the Project requirements and standards.

In this method, the Independent Analytical Checker receives only the Design Originator's final outcome or deliverable, and does not review the original calculations or methods used to obtain the solution. The Independent Analytical Checker must develop independent and appropriate calculation means and methods to verify the elements of the original calculation outcome. The independent check does not rely on the assumptions or judgment of the Design Originator, and is not constrained by decisions made by the Design Originator in the development of the original outcome. Each independent check shall include an independent development of the assumptions, analysis, specific details, completed drawings and final outcome to be used for the Project.

The Independent Analytical Checker may use a team of individuals to perform the independent analysis. The independent check team shall consist of individuals who are not members of the original team that developed the design being checked.

The independent set of calculations shall be prepared to the same level of detail and requirements as the original calculations, and shall incorporate the following items.

- The independent calculations shall be legibly written with references to author, date and subject included.
- The Independent Analytical Check Method shall meet all requirements of the Authority.
- References to applicable standards, criteria and specifications shall be clearly shown.
- Only computer software approved for the Project by the DM or DDL shall be used. All computer analyses included in the Independent Analytical Check Method calculations shall contain hardcopies of both input and output, and shall be in a format that clearly documents the usage, purpose and limitations of the program.
- Special attention shall be paid to the evaluation of all computer output for reasonableness before continuing with the independent design process. This should include spot checks of results using hand computations to verify orders of magnitude for results. Graphical plots should be used wherever possible or applicable to verify consistency and reasonableness of results.
- A calculation cover sheet shall be prepared for the Independent Analytical Check Method calculations.

The Independent Analytical Checker shall document all comments and recommended changes to the original design using the Independent Analytical Check Review Comment Form (see Form DCPR-4A). The Design Originator shall review the form and provide responses for each item.

Changes to the original calculation outcome made as a result of the Independent Analytical Check Method shall be clearly identified in the original calculations and Independent Analytical Check Method calculations. Both sets of calculations shall be maintained in the Project files. If changes are made to computer input or spreadsheet, including MathCAD, due to an IAC comment that have a cascading affect, only the revised and checked input or spreadsheet need be retained in the Check Print set. Closure of the comment will be achieved when the IAC Reviewer initials the "IAC Reviewer App'd" column on *Form DCPR-4A Independent Analytical Check Review Comment Form*.

After any disagreements have been resolved, the completed *Form DCPR -4A Independent Analytical Check Review Comment Form* shall be maintained in the Project files. The IAC and Form DCPR-4A will be provided to the DQCM during the Review of QC Documentation and will be kept as a Quality Record and submitted to the Authority at RFC.

The IAC will be performed prior to the Final submittal.

6.0 FORMS

Form DCPR-4 Review Comment Form

1.0 PURPOSE - To provide a uniform, orderly, efficient method for checking drawings before they are issued to the Contractor for construction and subsequent revisions necessitated during the construction phase.

2.0 SCOPE - This procedure identifies the requirements and guidelines for checking drawings that are developed as part of a set of final construction documents, for preliminary or non-construction purposes, or for inclusion in a study or report. The intent is to provide a consistent process for verifying the accuracy and completeness of drawing information, and for verifying and documenting corrections and/or changes that have been made. A consistent approach facilitates work sharing and promotes uniform quality control among multiple offices and disciplines.

3.0 DEFINITIONS

Design Originator – the individual who prepares the design calculations, sketches or other information used by the Drawing Originator.

Design Discipline Lead – an individual assigned to manage a specified element of work, usually associated with a specific technical discipline.

Detailed Check – a detailed review, sometimes referred to as “Red Line” or “Yellow Line” check.

Drawing – a representation of an object or form chiefly by means of lines, dimensions and other data. Drawings may be electronic or hard copy representations. Drawings are categorized as follows:

Non-Construction Drawings are drawings used for purposes other than construction, such as studies and reports, and include conceptual layouts, maps, graphs, pictures and charts.

Construction Drawings are drawings that are part of a set of documents used for construction, including construction phase modification drawings and exhibits that will be used for construction, and/or as a basis for producing shop drawings.

Drawing Backchecker (Drawing Correction Checker) – an individual assigned by the Design Manager or Design Discipline Leader to verify that corrections and additions marked-up by the Drawing Checker are correct. The Drawing Originator may serve as the Drawing Backchecker. Depending on the nature of the corrections and additions, the Design Originator or other qualified person may serve as the Drawing Backchecker.

Drawing Checker – an individual possessing necessary qualifications and assigned by the Design Manager or Design Discipline Leader to perform drawing checking. The Drawing Checker shall be independent of the Drawing Originator and shall not have developed any portion of the drawing being checked. The Design Originator may serve as the Drawing Checker as long as the Design Originator does not develop any part of the drawing and that any design calculations or accompanying design sketches prepared by the Design Originator, which are used by the Drawing Originator in developing the drawing, are checked by a different individual as part of the calculation checking process.

Drawing Originator – an individual assigned by the Design Manager or Design Discipline Leader to create a drawing. This person is generally shown as the Originator on the drawing check print stamp.

Drawing Rechecker (Verifier) – an individual assigned by the Design Manager or Design Discipline Lead to review the updated document and compare with the backchecked and approved check prints (plan drawing, or calculation sheet) to verify all corrections or changes were incorporated in the updated document.

Drawing Updater (Drawing Technician) – an individual assigned by the Design Manager or Design Discipline Lead to make changes to a drawing. The Drawing Updater may be the same as the Drawing Originator.

4.0 RESPONSIBILITIES

See 2.1 Definitions

5.0 PROCEDURES

5.1 Applicability

This procedure shall apply to Construction Drawings that are developed as part of the Project, and may also apply to Non-Construction Drawings at the discretion of the Design Manager or Design Discipline Leader.

5.2 Construction Drawings

All drawings that are to become part of a set of final construction documents shall receive a complete check using the Detailed Check Method (see Section 3.4). Detailed checking shall be completed prior to issuing drawings as information to others, including internal or external parties. Contemporaneously with detailed checking, Construction Drawings may also have an Interdisciplinary Review (IDR), and/or a Constructability Review (CR), as specified in this DQCP.

5.3 Non-Construction Drawings

5.3.1 Report Drawings

Drawings, sketches, figures or graphs developed as part of a study or report are not required to have a detailed check as specified for Construction Drawings, unless it is determined necessary and directed by the Design Manager or Design Discipline Leader.

5.3.2 Concept Drawings

Drawings showing the final proposed concept or layout of a facility, which are to be submitted to a client and/or will be used as a basis for final design or for developing Construction Drawings, are not required to have a detail check as specified for Construction Drawings, unless it is determined necessary and directed by the Design Manager or Design Discipline Leader.

When checked, concept drawings shall be checked using the Detailed Check Method (see Section 3.4) and reviewed for conformance to design standards, design economy, suitability, maintainability, and constructability, in accordance with Project requirements. Concept Drawings shall also be reviewed to determine that previous client comments and directives and previous QC Review comments have been addressed. Project specific checklists should be used where appropriate to determine if required information is provided and checked.

5.4 Detailed Check Method

The Detailed Check Method (sometimes referred to as “Red Line” or “Yellow Line” check) involves a check by the Drawing Checker of the information shown on a drawing for accuracy and completeness.

The Drawing Originator along with the Design Manager or Design Discipline Leader will determine when a drawing or set of drawings is ready for checking. The Design Manager or Design Discipline Leader shall assign a qualified individual as the Drawing Checker. Checking shall be done by an individual who was not the Drawing Originator.

The Design Manager or Design Discipline Leader shall review the Project scope with the Drawing Checker; advise the Drawing Checker of the schedule.

The Drawing Checker shall obtain a current set of supporting data that will be used in performing the detailed check. Supporting data may consist of prints of other reference or supplemental drawings, equipment data sheets and copies of any design calculations or design sketches that were used in developing the drawing.

The Drawing Checker shall review the drawings for:

- errors, ambiguities and omissions,
- conformance to the associated design calculations and sketches,
- adequacy and accuracy of dimensional data and notation,
- proper interface with other design elements or disciplines,
- consistency with other Project documents or drawings,
- overall constructability,
- conformance with Project drafting standards,
- conformance with general Project requirements,
- conformance with previous client review comments,
- conformance with applicable codes, laws and regulations, and
- conformance with previous QC Review comments.

Drawings showing separate or staged work, or work by other disciplines in the same area, shall be checked to verify that all work is coordinated and that conflicts do not exist between contracts or construction processes. Work by separate disciplines shown on the same drawing shall be checked by the appropriate Drawing Checker for each respective discipline.

5.5 Detailed Check Process

5.5.1 Check Print

The detailed check is performed on a plot, copy or print of the drawing, referred to as the original Check Print. A Check Print Stamp (refer to Figure 1.5.9-1) is placed on each Check Print to be checked. The Check Print Stamp is designed to show the status and history of the checking process, and to verify that each step in the detailed check process described below has been followed. The individual responsible for each step of the detailed check process shall initial and date the Check Print Stamp to document that their part of the process has been completed.

5.5.2 Check Print Color Coding System

A color coding system is used for marking on a Check Print to identify various actions to be taken and to identify the various stages of the checking process.

The recommended color coding system is presented below.

Yellow is used by the Drawing Checker to indicate agreement.

Red is used by the Drawing Checker to mark-up corrections, changes and additions.

Red is also used by the Drawing Backchecker to indicate approval (✓) or disapproval (✗) of Drawing Checker's mark-ups.

Yellow is also used by the Drawing Originator or Updater to indicate that changes to the original drawing have been made.

Green checkmark (✓) is used by the Drawing Rechecker to verify that the changes made to the original drawing are correct.

Blue or **blue cloud** is used for non-record comments or instructions.

5.5.3 Checking Sequence

The detailed check process shall include the following steps, which reference the recommended color coding system described in 3.5.2 above. Figure DCPR-05A illustrates the detailed check process steps in a flowchart. A color coding example is provided in Figure DCPR-05B.

Step 1. The Drawing Originator is responsible for reviewing the drawing for completeness and for correctness with regard to the Design Originator's sketches, spelling, drafting standards, etc. Upon determination that a drawing is complete and ready for detailed checking, the Drawing Originator will plot and stamp the Check Print with the Check Print Stamp and will initial and date the "**Originator**" line on the Check Print Stamp. This print will be the Original Check Print and will be marked Check Print No. 1.

Step 2. Prior to checking the drawing the Drawing Checker will confirm that applicable calculations have been checked, and will confirm through checking the drawing that the drawing matches the calculations. The Drawing Checker will review the relevant items on the Check Print, including lines, numbers and text, and will mark through or highlight in **yellow** each item that is agreed with. Highlighting the dimension value will indicate the entire dimension has been checked including the dimension leader lines and their placement. Checking for repetitive, closely spaced line work may be indicated by a yellow strike across the line work. This process should not be a "coloring exercise" – The Checker's clear intent should be used to evaluate the adequacy and purpose of the markups. Items that the Drawing Checker disagrees with are circled or crossed through in **red** and the correct information is written in red directly adjacent to the marked item. Other information to be added to the drawing is also written in red. The Drawing Checker may add comments to the Check Print to clarify corrections or additions but which are not to be added to the drawing. These comments should be marked in **blue** or blue cloud. When completed, the Drawing Checker will initial and date the "**Checker**" line as well as initial and date the "Dwg. Only: Checked against calcs. and calc. check confirmed" line on the Check Print Stamp. If there are no applicable calculations, the Drawing Checker will indicate such by indicating "N/A" for the initials on the "Dwg. Only: Checked against calcs. and calc. check confirmed" line on the Check Print Stamp.

Step 3. The Check Print is provided to the Drawing Backchecker, who is usually the Drawing Originator, to first check that the corrections and additions made by the Drawing Checker are correct.

Depending on the nature of the corrections and additions, the Design Manager or Design Discipline Leader will determine if another qualified person is needed to assist the Drawing Backchecker with checking the Drawing Checker's corrections or additions. This may occur if the Drawing Checker's corrections and additions require specialized expertise or affect the engineered performance of the detailed component. In these cases, the Design Manager or Design Leader may assign the Design Originator or other qualified individual to serve as the Drawing Backchecker.

The Drawing Backchecker will check all items marked in red by the Drawing Checker and place a **red** check mark next to each red correction or addition that is agreed with. Comments or corrections not to be incorporated will be marked with a red 'x'. Any disagreements found during this process must be resolved to both the Drawing Checker and the Drawing Backchecker's satisfaction. If agreement cannot be reached, the issue shall be brought to the attention of the Design Manager, Design Discipline Leader or the Engineer of Record, and the DQCM. Unresolved disagreements involving technical issues shall be decided by the Engineer of Record. If the disagreement is resolved such that the comment or correction will be incorporated, the red "x" will be changed to a red check mark.

When completed, the Drawing Backchecker will initial and date the “**Backchecker**” line on the Check Print Stamp.

Step 4. All marked-up corrections or additions that have been checked (as indicated with a red check mark (√) on the Check Print next to the red mark-up) will be made. After making changes, the Drawing Updater responsible for incorporating the changes, will mark through or highlight the marked changes in **yellow**, as the update is made, to indicate that the change has been made. When all corrections or additions are made, the Drawing Updater will initial and date the “**Updater**” line on the Check Print Stamp.

Step 5. Check Print No.1 together with a plot or print of the corrected drawing (Corrected Print) is returned to the Drawing Checker, who will compare the Corrected Print against Check Print No.1. The Drawing Checker will place a **green** check mark (√) next to each red check mark on Check Print No.1 indicating the change was made correctly. Incorrect or unincorporated changes will be noted in red on Check Print No.1 to indicate need for further correction. The Checker will all place a green check mark adjacent to edits that were agreed not to be included to indicate closure of the comment.

Depending on the extent of required further correction, the Drawing Checker may re-mark the further corrections in red on the Corrected Print for better clarity, in which case, the Corrected Print will be stamped Check Print No.2, and the Drawing Checker will initial and date the “Checker” line on the Check Print No.2 Check Print Stamp. When finished, Check Print No.1 and Check Print No.2 (if used for re-marking) will be grouped together, with Check Print No.2 on top, and returned to the Drawing Updater for a second round of corrections.

Step 6. Once the second round of corrections has been back checked, resolved and made, the Drawing Updater will mark through or highlight the re-marked changes in yellow on Check Print No.1 (or on Check Print No.2 if used for re-marks) to indicate that the change has been made. When all corrections are made, the Drawing Updater will re-initial and date the “Updater” line on Check Print No.1 (or on Check Print No.2 if used for remarks). Another Corrected Print of the drawing will be made.

Step 7. The Drawing Rechecker will compare the new Corrected Print against Check Print No.1 (or Check Print No.2 if used for re-marks) to verify that the re-marks were incorporated correctly. The Drawing Rechecker will place a green check mark (√) next to the red re-marks indicating the change was incorporated correctly.

This process is to be repeated until all of the corrections and additions marked on Check Print No.1 (and subsequent Check Prints if used for re-marks) have been incorporated to the Drawing Checker’s satisfaction. The Rechecker verifies that all of the required steps of the checking process have been performed and documented on the Check Print. When the Drawing Rechecker is satisfied that all corrections and additions have been made, the Drawing Rechecker initials and dates the “**Rechecker**” line on the Check Print No.1 Check Print Stamp and on all subsequent Check Print Stamps.

For each submittal, Check Print No.1 and all subsequent Check Prints of the same sheet may be grouped together, with the most current on top. Check Prints may also be grouped together by Check Print number or as directed by the Design Manager, Design Quality Manager or Design Leader. At the discretion of the DLL, Check Print numbers may be sequential across submittals. This produces a continuous check print number sequence for a given drawing.

5.5.4 Check Print Stamp Protocol

The following describes the check print stamp protocol.

- The Checker and Rechecker must be independent from the Originator, Backchecker and Updater.
- The Checker and Rechecker do not have to be the same person, but it is preferred.

- Originator, Checker and Backchecker are always required. Updater and Rechecker are required based on Checker's red lines.

5.6 Revisions to Previously RFC, Previously Checked and New Drawings

The detailed check process described in Section 3.5 shall be performed on all drawings that undergo revisions after the drawing has been Issued as Readiness for Construction or a drawing is added to a Design Package through the DCN process described in DCPR-11 *Design Change Notice*. Prior to checking the drawing the Drawing Checker will confirm that applicable new or revised calculations have been checked, and will confirm through checking the drawing that the drawing matches the calculations (Refer to Section 3.6.3, Step 2 above). The Drawing Checker will initial and date the "Dwg. Only: Checked against calcs. and calc. check confirmed" line on the Check Print Stamp. If there are no applicable revised or new calculations, the Drawing Checker will indicate such by indicating "N/A" for the initials on the "Dwg. Only: Checked against calcs. and calc. check confirmed" line on the Check Print Stamp.

Changes to a drawing as a result of a CR, ICR, or QCR comment is checked and confirmed by the reviewer as evidenced by his/her initials in the "Reviewer App'd" column on the associated comment form. Depending on the extent or complexity of the comment, a check print may be created to facilitate the verification of the design change..

Check Prints shall be stored as Quality Records to document the process.

All drawing revisions shall be fully coordinated with other associated drawings or with all work by other disciplines in the same area.

5.7 Incorporation of External Review Comments

If the changes that are requested by a third party, after the detailed check, are simple in nature, the Design Discipline Lead with the concurrence of the DQCM may abbreviate the checking process by noting the changes in red on a new Check Print. The Check Prints should be sequentially numbered. The Design Discipline Lead shall sign the Check Print as the Backchecker, indicating that the changes do not materially affect the design.

Changes that are more material in nature and which require review by the Designers are returned to the Design Discipline Leads for review and incorporation of the changes. In this case, the normal correcting and verifying processes will be used per Section 3.5 above.

5.8 Disposition of the Checked Drawing

The completed original (or CADD file) is put under the control of the Design Discipline Lead in order to prevent further changes in the drawing that could invalidate the checking which has been done. Upon completion of the QC checking and QA processes, the QC records will be provided to Document Control. The Check Print(s) shall be retained by the Document Control in an orderly, organized fashion. This will also serve as a record or history of the design/ drawing evolution, which will provide traceability of the final product.

5.9 Validated Drawings

Project Wide drawings are drawings that are common to multiple Design Units. Once a Project Wide drawing has been fully checked using the Detail Check method, it can be considered "Validated" and does not need to be fully checked each time it is used. A fully checked sheet and clean record sheet will reside in the Project data base as evidence of prior checking. When a validated sheet is used in a

subsequent submittal, the Originator will affix a Check Print Stamp, indicate the Check Print number and date, initial and date the "Originator" line indicating it is ready for checking, and write "Validated" in blue on the drawing. The Checker will verify the sheet is validated and strike the sheet in yellow. If no changes are indicated by the Checker, the Backchecker will initial and date the Check Print Stamp. Any minor changes specific to the submittal will be redlined and the checking process detailed in Section 5.5 will be followed.

Validated drawings will be stored in ProjectWise at: [16.08 Validated Drawings](#).

pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control

Plan\16.08_Validated Drawings\

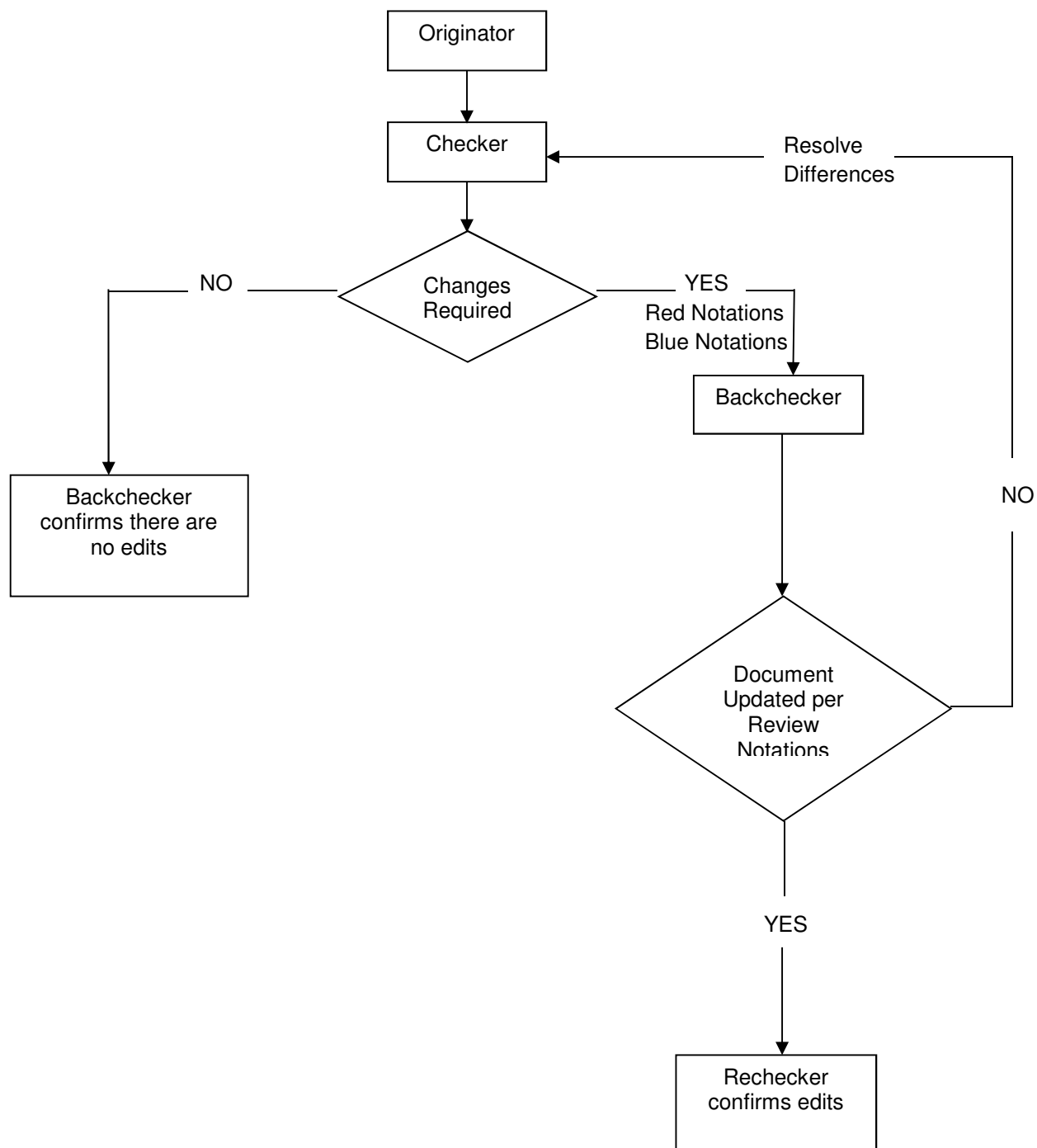
6.0 FIGURES:

Figure 1.5.9-1, Check Print Stamp

Figure DCPR-05A, Quality Check Flow Chart

Figure DCPR-05B, QC Check Print Color Coding Example

**Figure DCPR-05A
QUALITY CHECK FLOW CHART**



**Figure DCPR-05B
QC Check Print Color Coding Example**

Originator: Something wuz correct and sumthing was incorrect.

Checker: was corect something
 Something ~~wuz correct~~ and ~~sumthing~~ was
 incorrect.
 Turn Level 54 off.

Backchecker: X X ✓
was corect something
 Something ~~wuz correct~~ and ~~sumthing~~ was
 incorrect.
 Turn Level 54 off. ✓

The Originator and Checker resolved disagreements.

✓ X X ✓
was corect something
 Something ~~wuz correct~~ and ~~sumthing~~ was
 incorrect.
 Turn Level 54 off. ✓

The Updater prints or plots the corrected document and provides to the Verifier / Rechecker along with the Check Print.

✓ X ✓ X ✓ ✓
was corect something
 Something ~~wuz correct~~ and ~~sumthing~~ was
 incorrect.
 Turn Level 54 off. ✓✓

Rechecker:

The Originator disagreed with the edit proposed by the Checker, but subsequently agreed and affixed a red line through the red "x" and then the Originator affixes a red check mark.

Since the Originator disagreed with the edit proposed by the Checker, and the Checker subsequently agreed, then the Checker, as the Rechecker, affixes a green check mark to close the edit.

Subject: **CHECKING DRAWINGS**

Procedure No. **DCPR-05**

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Revision **1**

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1.0 PURPOSE - To provide for systematic checking of computerized design calculations to minimize the possibility of input errors.

2.0 SCOPE - This procedure is to be used for checking both non-locals (batch) input and local keyed input to PC's. An Input Check process will be used.

3.0 DEFINITIONS

N/A

4.0 RESPONSIBILITIES - Originators must provide the input/output documents and other associated data to the Checkers in a timely and complete manner so that the checking can be quick and thorough. Checkers shall mark up the input completely in **yellow** if it is correct and **red** if in error, sign and date the checked input.

Originator: Responsible for creating a review document affixing the QC Stamp and providing the check print; responding to comments; reaching concurrence with the Checker for proposed changes that will not be incorporated; and, printing revised documents for the Checker. The Originator shall provide the Design Package No. or description with the percent review in the top of the Check Print Stamp. If a subsequent Check Print is printed, then this information will be provided in the subsequent Check Print.

Checker/Rechecker: an individual possessing the necessary qualifications to perform checking. The Checker shall be independent of the Originator and shall not have developed any portion of the input being checked..

Backchecker: an individual assigned to verify that corrections and additions marked-up by the Drawing Checker are correct. The Originator may serve as the Backchecker. Depending on the nature of the corrections and additions, the Originator or other qualified person may serve as the Backchecker.

Updater: an individual assigned to make changes to a drawing. The Updater may be the same as the Originator.

5.0 PROCEDURE

When any computer program is run for design, the input and output must also be printed out at the same time. For non-local (batch) programs, the Originator makes a Check Print copy of the input for checking. If the changes to the input affect the Checker's ability to review the output for reasonableness due to cascading changes, for example, then the Originator will rerun the program and present the input and output to the Checker as Check Print 2.

5.1 Checking Sequence

Step 1. The Originator is responsible for reviewing the input and output for completeness and for correctness with regard to the basis of design, etc. Upon determination that a input and output is complete and ready for detailed checking, the Originator will copy the input and output to create the Check Print and stamp the Check Print with the QC Stamp and will initial and date the "**Originator**" line on the QC Stamp. This copy will be the Original Check Print and will be marked Check Print No. 1, and dated.

Step 2. The Checker will check the input for accuracy on the Check Print and will mark through or highlight in **yellow** each item that is agreed with. Checking for repetitive input may be indicated by a

yellow strike across repetitive data. Items that the Checker disagrees with are circled or crossed through in **red** and the correct information is written in red directly adjacent to the marked item. Other information to be added to the input is also written in red. The Checker may add comments to the Check Print to clarify corrections or additions but which are not to be added to the drawing. These comments should be marked in **blue** or blue cloud. If the Checker proposes changes to the input that would affect the review of the output for reasonableness, then the reasonableness review is not required at this time. If the Checker does not propose changes to the input that would affect the review of the output for reasonableness, then the reasonableness review is conducted. When completed, the Checker will initial and date the "**Checker**" line on the QC Stamp.

Step 3. The Check Print is provided to the Backchecker, who is usually the Drawing Originator, to confirm that the corrections and additions made by the Checker are correct. If there are no edits proposed by the Checker, the **Backchecker** initials and dates the check print stamp.

Otherwise, the Backchecker will review all items marked in red by the Drawing Checker and place a **red** check mark next to each red correction or addition that is agreed with. Comments or corrections not to be incorporated will be marked with a red "X". Any disagreements found during this process must be resolved to both the Checker and the Backchecker's satisfaction. If agreement cannot be reached, the issue shall be brought to the attention of the DM, DDL or the Engineer of Record, and the DQM. Unresolved disagreements involving technical issues shall be decided by the Engineer of Record. If the disagreement is resolved such that the comment or correction will be incorporated, the red "X" will be crossed out and a red check mark affixed by the Backchecker. When completed, the Backchecker will initial and date the "**Backchecker**" line on the QC Stamp.

If resolution of disagreements results with all proposed edits by the Checker agreed not to be incorporated, then the Checker will perform the reasonableness review at this time. Since the QC stamp already has the Checker's initials and date, a second set of initials and dates will be entered.

If there are no corrections to the input, the original and checked input and output are retained to be provided to the DQCM for confirmation, usually during the Review of QC documentation conducted by the DQCM.

Step 4. All marked-up corrections or additions that have been agreed to by the Backchecker (as indicated with a red check mark (✓) on the Check Print next to the red mark-up) will be made. The Updater responsible for incorporating the changes will mark through or highlight the marked changes in **yellow**, as the update is made, to indicate that the change has been made. When all corrections or additions are made, the Updater will initial and date the "**Updater**" line on the QC Stamp.

Step 5. Once all the updates have been made to the input, the Originator re-runs the program and the checking process is repeated starting with step 1. The check print provided to the Checker is marked check print No. "2". If there are no additional edits to the input the Checker reviews the output for reasonableness.

Check Print No.1 together with a **copy** of the revised input and output identified as Check Print No. 2 is provided to the Checker, who will compare the Check Print No. 2 against Check Print No.1. The Checker will highlight the corrected value on the Check Print No. 2 indicating the change was made correctly. Incorrect or unincorporated changes will be noted in red on Check Print No. 2 to indicate the need for further correction – return to Step 1. The Checker will place a green check mark adjacent to edits on Check Print No. 1 that were agreed not to be included to indicate closure of the comment. If there are no further edits, the Checker initials and dates the "**Checker**" line on the Check Print no. 2 and initials and dates the **Rechecker** line on Check Print No. 1 and returns both Check Prints to the Backchecker.

Step 6. The **Backchecker** initials and dates the Check Print stamp No. 2.

Subject: **CHECKING INPUT TO COMPUTER
PROGRAMS**

Procedure No. **DCPR-06**
Page **3 of 4**
Revision **1**

For each submittal, the latest Check Print and clean original set are provided to the DQCM during the review of QC Documentation. All check prints are retained as Quality Records.

6.0 REFERENCES

Figure 1.5.9-1, Check Print Stamp

Subject: **CHECKING INPUT TO COMPUTER
PROGRAMS**

Procedure No. **DCPR-06**
Page **4 of 4**
Revision **1**

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1.0 PURPOSE - To provide guidelines for the checking of Specifications and Special Provisions. Checking and review of Specifications and Special Provisions are conducted to assure that the engineering for the Project meets Project requirements. Measures for the selection and review of materials, equipment, and elements of the Work included in the Project are handled with specifications that are developed during the design process. This procedure supplements design in order to assure that work is adequately specified.

2.0 SCOPE - This procedure applies to Specifications and Special Provisions. Documents are created in and maintained in the Project database. A 100% Document Check process will be used.

3.0 DEFINITIONS
N/A

4.0 RESPONSIBILITIES

Design Discipline Leader - is responsible for implementing this procedure.

Originator - has the primary responsibility for accuracy and adequacy of the Specifications or Special Provisions. The Originator of each document is responsible for making the Check Print, following that Check Print through the checking process, and obtaining the required sign-offs.

Checker/Rechecker - responsible for checking the Specifications or Special Provisions, independent of the Design Discipline Leader or Originator.

Backchecker - responsible to verify that corrections and additions marked-up by the Checker are correct. The Originator may serve as the Backchecker. Depending on the nature of the corrections and additions, the Originator or other qualified person may serve as the Backchecker.

Updater - responsible to make changes to a Specification. The Updater may be the same as the Originator.

5.0 PROCEDURE

5.1 Completing the Specifications (Special Provisions)

As each specification is completed in final format and deemed ready for checking, the Originator makes a Check Print copy, and affixes, numbers and dates the Check Print Stamp, Figure DCPR-05A, on the cover sheet of each specification to be checked.

5.2 Checking

The Checker checks the Check Print of the specification for applicability and clarity. In order to document the checking process, the Checker highlights in yellow on each Check Print page indicating that it was checked; corrections are annotated in red and the sheet may be tabbed for easy location. The Checker will initial and date the "Checker" box on the Check Print Stamp upon completion of the check.

5.3 Backchecking

The Backchecker (Originator) reviews the Checker's corrections on the Check Print. To document the backchecking process on the Check Print, the Backchecker:

- Check marks in **red** each of the Checker's red-marked corrections if in agreement.
- The Backchecker will place a red "X" next to a change or correction not to be incorporated. If a change or correction is not to be incorporated, the Originator will discuss the change or correction with the Checker and attempt to reach a resolution. If agreement cannot be reached, the issue shall be brought to the Design Discipline Lead associated with the "review copy" for resolution. Unresolved disagreements involving technical issues shall be resolved by the Engineer of Record. If the disagreement is resolved such that the change or correction will be incorporated, the red "X" will be crossed out and a red check mark affixed. The Backchecker will then initial and date the "**Backchecker**" box on the Check Print Stamp. The Backchecker should not obliterate the Checker's marks.

NOTE: *The Backchecker and Checker should resolve differences encountered during the checking process so they are not repeated over and over again. If the two individuals cannot achieve resolution, the appropriate Design Discipline Leader should be requested to resolve the differences.*

5.4 Correcting the Electronic Text File

Updating of the specification Electronic Text File can be done by the Originator, Backchecker, or by an Updater. When updating the specification to incorporate the Check Print corrections, the Updater (engineer, administrative assistant) yellow highlights each red-marked correction on the Check Print as it is incorporated. The person incorporating the edits will initial and date the "Updater" box on the Check Print Stamp when all the edits are complete. The Updater will make a new print of the specification and attach it to the previous Check Print.

5.5 Verifying the Corrected Check Print

The Rechecker verifies that all of the required steps of the checking process have been performed and documented on the Check Print. Upon verification, the Rechecker signs and dates the "Rechecker" box on the Check Print Stamp on the Check Print as approved.

5.6 Disposition of the Checked Specification

The completed original is put under the control of the Design Manager in order to prevent further changes in the specification that could invalidate the checking which has been done. The Check Print(s) shall be retained by the DQCM in an orderly, organized fashion for future audit. This will also serve as a record or history of the design/ drawing evolution, which will provide traceability of the final product.

6.0 FIGURES

See Figure 1.5.9-1	Check Print Stamp
Figure DCPR-07A	Specification Footer Examples
Figure DCPR-07B	Example Specification Log

7.0 Version Control

The footer of the specification will indicate the version and date of the specification similar to Figure DCPR-07A. In addition, a master log similar to Figure DCPR-07B will be used and retained in ProjectWise to aid in tracking the latest revision.

Figure DCPR-07A Specification Footer Examples

Tappan Zee Hudson River Crossing Project Ready For CR, IDR, QCR	03 80 00 - 3 CONCRETE CUTTING AND BORING	June 12, 2013 "Design Pkg #", Rev. B
Tappan Zee Hudson River Crossing Project RFC Submittal	03 80 00 - 3 CONCRETE CUTTING AND BORING	June 12, 2013 "Design Pkg #", Rev. 0

Tappan Zee Hudson River Crossing Project Specification Log

[illegible]

1.0 PURPOSE - This procedure identifies the requirements for checking spreadsheets used in developing designs.

2.0 SCOPE – This procedure applies to all spreadsheets used as part of a design task.

3.0 DEFINITIONS

Deliverables - documents submitted for Readiness for Construction.

Design Discipline Lead – an individual assigned to manage a specified functional group, usually associated with a specific technical discipline.

Formula Report – a report that creates a copy of embedded spreadsheet cell formulas for use in checking and documenting the accuracy of spreadsheet calculations.

Spreadsheet – an electronic file that arranges data in rows and columns to facilitate organization and manipulation of information, including macros or embedded coding.

Spreadsheet Author – an individual who develops a spreadsheet for specific project use in a single application or for repeated use.

Spreadsheet Checker – an individual possessing necessary qualifications and assigned to perform spreadsheet checking. The Spreadsheet Checker shall be independent of the Spreadsheet Author.

4.0 RESPONSIBILITIES

Calculation Originator – the individual who develops the original calculations.

Calculation Checker – an individual possessing necessary qualifications and assigned by the Design Manager or Design Lead to perform checking of the mathematical computations of a calculation. The Calculation Checker shall be independent of the Calculation Originator.

5.0 PROCEDURES

5.1 Applicability

This procedure shall apply to spreadsheets that are developed or used in any of the following categories:

- Are part of final design calculations;
- Are directly a part of Project deliverables; or,
- Serve as a basis for Project deliverables.

5.2 Checking of Spreadsheets

Spreadsheets shall receive a complete check in accordance with the following:

The Spreadsheet Checker shall use the Detail Check Method identified in DCPR-03, Checking Calculations, to check input and output. Formulas used in spreadsheets shall be verified for appropriate application. The Spreadsheet Checker shall also verify the reasonableness of the spreadsheet results.

The accuracy and results of cell formulas shall be verified in one of the following alternative ways:

- Checking may be performed using any of the methods described below:

- A Formula Report may be used to print, check and document all embedded cell formulas.
 - A spreadsheet printout with formulas displayed within the cells may also be used in lieu of a Formula Report for checking spreadsheets with short formulas that can be fully printed out.
 - Hand calculations may also be used to verify the accuracy of spreadsheet cell results. If hand calculations are used, they shall be included in the Project calculations for documentation. Hand Calculations may be performed directly on copies of the spreadsheet printout or on standard computation sheets.
- An independent spreadsheet or alternative independent calculation method may be used to verify the results of the initial spreadsheet. A printout of the independent spreadsheet or copies of calculations for alternative checking calculation methods shall be included in the Project calculations for documentation.
 - For spreadsheets that are set up with data and repetitive formulas in tabular format, checking may be performed using one of various alternative methods accompanied by on-screen verification. The first formula applications may be checked using either: hand calculations, Formula Report, or spreadsheet printout with formulas displayed within the cells. Subsequent formula applications may then be checked on-screen to verify that all formulas are repeated correctly. Documentation shall be included that a visual check was made on-screen. This check documentation shall be done on a printed copy of the spreadsheet using the Detail Check method as outlined in DCPR-03, Checking of Calculations.

It is not necessary to print out and/or check the embedded cell formula(s) if the Spreadsheet Checker uses hand calculations to check a cell formula, or if the Spreadsheet Checker uses an independent spreadsheet or independent alternative calculation method.

5.3 Validated (Project) Spreadsheets

Spreadsheets that will be used repeatedly may be checked and stored in the ProjectWise as a Validated Spreadsheet template. The documentation of the checking shall also accompany the usable version of the spreadsheet in ProjectWise at the following link: [16.06 Validated Spreadsheets](#).

pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control Plan\16.06_Validated Spreadsheets\

The spreadsheet template must be fully checked using one of the following methods:

- Check of all formulas using the Formula Report Excel add in;
- Check of all formulas by printing formulas viewed directly in cells; or,
- Detail check of all formulas and possible logical decisions using hand calculations.

A Validated Spreadsheet author (or designee) shall keep and maintain the original documentation for checking spreadsheet cell results. The spreadsheet author and checker will be identified and shown in locked cells. The template will be locked and protected with a password following the check. Documentation of the check must accompany the standard spreadsheet. Additional cells will be used to identify the Originator of the specific input and the Checker.

Checking of a Validated Spreadsheet is limited to the input cells since the formulas and applicability has already been checked. A brief description of the use of the spreadsheet will also be provided near the top of the spreadsheet to guide users in the application of the spreadsheet.

5.3.1 Use Validated (Project) Spreadsheets

The requirements for using a Validated Spreadsheet are as follows:

- Users shall not modify the Validated Spreadsheet except to enter Project-specific information in the header or highlighted input data. If items other than the header information or input data are revised in any way, the spreadsheet shall be considered a Modified and checked as a non-validated spreadsheet.
- For normal operation, only the header and input cells shall be open for editing; all other spreadsheet cells shall remain locked/protected.
- The Spreadsheet Checker shall use the Detail Check Method identified in DCPR-06, Checking of Calculations, to check the header and all input data. The Spreadsheet Checker shall also verify the reasonableness of the spreadsheet results.

6.0 REFERENCES

DCPR-03	Checking Calculations
Figure 1.5.9-1	Check Print Stamp
Figure DCPR-05A	Quality Check Flow Chart
Figure DCPR-05B	QC Check Print Color Coding Example

Subject: **CHECKING SPREADSHEETS**

Procedure No. **DCPR-08**

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Revision **1**

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1.0 PURPOSE – The purpose of this DCPR is to define the QA/QC processes associated with revisions to Issued as Readiness For Construction documents.

2.0 SCOPE - The design changes handled by this DCPR include:

- Design changes initiated by the Design Team that occur after a design package has been Issued as Readiness For Construction.
- Design changes initiated by the Contractor that occur after a design package has been Issued as Readiness For Construction

A design package may consist of drawings, report, and/or specifications with associated calculations, if any.

3.0 Definitions

Notice of Design Change (NDC) – form used to notify the Contractor of a revision to Issued as Readiness for Construction Document.

Readiness for Construction Document – a document that has been accepted by the Authority and issued as ready for construction by the Design Team.

Design Originator – the individual that prepares the design calculations, sketches or other information used by the Drawing Originator.

4.0 RESPONSIBILITIES

Originator – the individual who prepares the revised design calculations, drawings, report or other information used by the Contractor.

Design Discipline Leader (DDL). Notifies the DM of the change, identifies the source, describes the change, and provides the background or justification for the change, along with proposed details or language, as appropriate for the NDC form. The DDL also provides input to the Originator for the level of checking and review necessary. The DDL initiates the checking and review process as defined on the NDC form when the design is complete.

Design Quality Control Manager (DQCM). The DQCM will review the QC and supporting documentation to verify compliance with this DCPR. Will sign the *Form DCPR-13A*

Design Quality Assurance Manager (DQAM). The DQAM will review the revisions and provide QA certification as per the DQAP.

5.0 PROCEDURES - The QC process will be determined jointly by the DM and DDL associated with the submittal on a case-by-case basis. The results of the discussion of the QC requirements will be documented on the *Design Development and QC Process Documentation* form. Once the Checking and Review process has been defined, the process of the applicable DCPR will apply.

5.1 Drawings – Drawings may either be added to the design package through an NDC or a previously Issued as Readiness for Construction drawing may be revised. New drawings will be checked in their entirety. Only changes to previously Issued as Readiness for Construction drawings will be checked. The checking procedures for drawings are defined in DCPR-05. When required, reviews will be conducted according to the applicable DCPR.

5.2 Specifications – New specifications do not require an NDC. Instead, the letter associated with the design package number will be incremented and appended to the previous specification submittal. New specifications will be checked in their entirety. Only changes to a previously Issued as Readiness for Construction specifications will be checked. The checking procedures for specifications are defined in DCPR-07. The footer of the specification will identify the revision number and issue date. When required, reviews will be conducted according to applicable DCPR.

5.3 Reports – Changes to a previously Issued as Readiness for Construction reports as a result of an NDC will be checked. The checking procedures for reports are defined in DCPR-02. When required, reviews will be conducted according to the applicable DCPR.

5.4 Calculations – Changes to previously Issued as Readiness for Construction calculations as a result of an NDC will be checked. The original calculations may be changed or superseded at the discretion of the Engineer of Record. The checking procedures for calculations are defined in DCPR-03 and DCPR-08. Unless there are major changes to the design, as determined by the Engineer of Record, an Independent Analytical Check (IAC), load rating, and/or the Authority's structure certification letter will not be required.

5.5 Input to software – Changes to software input previously Issued as Readiness d for Construction as a result of an NDC will be checked. The original input/output will be superseded by the revised computer run and appended to the calculations. The procedures for checking of input to software for calculations are defined in DCPR-06.

5.6 Identification of Revisions or Additions to Previously Released Documents

5.6.1 For drawings, revisions will be identified in the revision block and the current revision identified by a revision cloud and revision triangle. Previous revision clouds and revision triangles will be removed if the drawing is subsequently revised. Revision numbers are sequential for a sheet. The drawings will contain the following information:

- For new drawings: The revision block will include the revision "0" in the "SYM." box; the submittal date; the NDC number and design package number in the DESCRIPTION box; and, Originator initials in the "BY" box. If there is room in the DESCRIPTION box, also show "new sheet". No revision cloud or triangle is required.
- Partial change to an existing drawing: The next revision number for the sheet in the revision triangle (i.e., 1) outside and next to the revision cloud for each revision or group of revisions. The revision block will include the same revision number as in the revision triangle in the "SYM." box; the submittal date; the NDC number and design package number in the DESCRIPTION box; and, Originator initials in the "BY" box. If there is room in the DESCRIPTION box, also show a brief description of the revision.
- Two methods may be used, at the judgment of the Engineer or Architect of Record, if an existing sheet is revised in its entirety:
 1. A revision cloud will be drawn around all the design shown on the sheet. A revision triangle and number will also be shown. The revision block will include the same revision number as in the revision triangle in the "SYM." box; the submittal date; the NDC number and design package number in the DESCRIPTION box; and, Originator initials in the "BY" box. If there is room in the DESCRIPTION box, also show "entire sheet".
 2. No revision cloud or triangle shown on the sheet. The revision block will include the next

sequential revision number in the "SYM." box; the submittal date; the NDC number and design package number in the DESCRIPTION box; and, Originator initials in the "BY" box. If there is room in the DESCRIPTION box, also show "entire sheet".

5.6.2 Revisions to previously Issued as Readiness for Construction MSWord documents will be identified using "track changes". Additions to the document will be underlined and deletions will be in "revision balloons" in the right-hand margin. The footer will identify the NDC number, design package number and revision number. Revision numbers are sequential for a text document.

5.7 Sealing, Signing and Dating Revised Documents— the following details how revised drawings will be re-sealed, re-signed and re-dated. The requirements are similar for other documents.

- Revisions by the original licensee: the original licensee will re-sign and re-date revisions to the previously signed, sealed and dated drawing. The re-dated seal will be the date the signature is re-affixed. A new signature and date must be re-affixed since any changes to the electronic copy invalidates the signature and the date represents when the signature is affixed.
- Revisions by a second licensee taking responsibility for the changes only:

"It is a violation of law for any person, unless they are acting under the direction of a licensed professional engineer, architect, landscape architect, or land surveyor to alter an item in any way. If an item bearing the stamp of a licensed professional is altered, the altering engineer, architect, landscape architect, or land surveyor shall stamp the document and include the notation "altered by" followed by their signature, the date of such alteration, and a specific description of the alteration".

Since the original licensee's signature is automatically removed when the drawing is revised, the original licensee's signature and original date must be reattached by the original licensee.

5.8 NDC Process – Requests for changes to RFC documents can originate from either the field through a Field Design Change (described in the Project QMP) or from the design team. The outline below describes the process to develop an NDC.

- The Design Team discovers or determines that it may be necessary to change a previously Issued as Readiness for Construction set of documents. The change may be in the form of an updated or additional drawing or an update to an existing specification, for example. This possible change is brought to the attention of the DDL or DM.
- If the DDL or DM concur that an NDC is required, the Originator obtains an NDC number from project controls. If the change is initiated from the field, the Originator obtains an NDC number, and the remainder of the process is followed.
- The Originator will complete *Form DCPR-09 Notice of Design Change* and prepare supporting documentation. The supporting documentation identifies the area on a drawing, for example, where the change is to occur so that the contractor can cease operations in that location.
- The Originator will e-mail the Form DCPR-09 and supporting documentation to the TZC JV. The design project controls group shall be copied on the e-mail to the TZC JV.
- After receipt of approval from TZC JV, Originator will modify the document, discuss the checking and review process required with the DM and complete the *Design Development and QC Process Documentation* form, and cause the required QC to occur. When the checking and review is complete, the Originator will complete the *Originator Certificate of Completion* form.

- The Originator will provide the QC package as described in Section 5 below to the DQCM for review. The DQCM will initial the *Design Development and QC Process Documentation* form and provide *Form 13A Internal Design Quality Audit Checklist*.
- The Originator will populate the transmittal folder with an electronic copy of the revised document with a new seal, signature and date, and Form 13A. The Originator will also complete a transmittal and inform project control that the submittal is ready for DQM concurrence.
- Project controls will request concurrence from the DQCM that the NDC is ready to transmit. Upon receipt of concurrence, project controls transmits the NDC form, revised documents to TZC JV.

5.9 QA SUBMITTAL REQUIREMENTS – The following documents will generally be required for the DQCM to review a submittal:

- Check Prints showing the check and/or review performed.
- Track changes version of an MSWord document.
- “Clean” set of documents reflecting the checked changes.
- NDC form and supporting documentation such as a Request for Information form and/or sketches that describe the proposed change.
- Originator Certificate of Completion form.
- *QC Process Documentation* form.
- Forms for CR, IDR, and/or QCR if applicable based on the requirements in Section 5 above.

Revisions to RFC documents will follow the QA processes defined in the DQAP.

NOTE: Revisions to RFC documents will be re-sealed, re-signed and re-dated to avoid confusion regarding what the latest version of a document is.

6.0 REFERENCES

DCPR-02	Checking Reports and Studies
DCPR-03	Checking Calculations
DCPR-05	Checking Drawings
DCPR-06	Checking Input to Computer Programs
DCPR-07	Checking Specifications
DCPR-08	Checking Spreadsheets
DCPR-11	Constructability Review (CR) and Interdisciplinary Review (IDR)
DCPR-12	Quality Control Review (QCR)
DCPR-17	Readiness For Construction (RFC)

7.0 FORMS

Form DCPR-4	Review Comment Form
Form DCPR-11	Review Cover Sheet
Form DCPR 13A	Internal Design Quality Audit Checklist
Form DCPR-09	Notice of Design Change

1.0 PURPOSE – To prescribe the method and documentation required before using computer software (other than industry standard programs), that may be used for performing design calculations.

2.0 SCOPE – The requirements for verification of software apply for all purchased, contracted, or locally prepared software that is other than an approved industry standard program and is to be used for design or calculations. When computer programs are used from the list of approved industry standard programs in Section 7.1, or from the list of validated non-industry standard programs in Section 7.1, the input will be checked using the Detailed Check method and the output will be checked for reasonableness in accordance with DCPR-06 *Checking of Input to Computer Programs*.

3.0 DEFINITIONS
Not applicable.

4.0 RESPONSIBILITIES .

Design Manager – The Design Manager will develop and update the list of approved computer software based on input from the Design Discipline Leads.

Design Discipline Leaders - Provide a list of computer programs for Design Manager approval. Identify the other than industry standard software that will be used and assess the availability of verification documentation for that software. When documentation for a particular application does not exist, appropriate assignments must be made to fulfill the requirements of this procedure.

5.0 PROCEDURE

Design Team firms may have an alternate equivalent validation procedure. In this case the alternate procedure will be maintained in ProjectWise and accompany the associated validation.

Procured computer programs and software that are accepted as industry standard by nationally-recognized professional and trade organizations or by regulatory agencies do not require validation prior to Project use. Examples include utility programs used for word processing, drawing generation and presentations. Microsoft Excel does not require software validation; however, the output, if used in a calculation, shall be checked in accordance with DCPR-08 *Checking Spreadsheets*.

Procured computer programs and software that are approved for this Project and considered accepted as industry standard because of its widespread use are listed in Section 7.0. These computer programs and software do not require validation prior to its use since the validity of the computer model is verified, the input to the computer program is checked for accuracy and the resulting output is evaluated for reasonableness during the QC process in accordance with DCPR-06 *Checking of Input to Computer Programs*.

Procured computer programs or software that are not industry standards or not developed under a documented quality assurance plan, and computer programs and software developed in-house, including software add-ins and macros shall be subjected to this validation process prior to Project use.

When the same software is used by multiple offices/firms, the same version of that software is to be used across all locations and firms to reduce the likelihood of errors. Only the versions specified in the Approved List are to be used. If a new version is released of a program on the Approved List, it must be re-verified before it can be used.

Questions regarding the applicability of this procedure to a particular software program should be directed

to the Design Quality Control Manager for resolution.

One of the following four procedures shall be used to validate the output from non-industry standard software used on the Project, where applicable.

1. Hand Calculation
 - a) Software may be validated by comparison to a hand calculation. The hand calculation shall use the same input assumptions as the software input.
 - b) Checked calculations from a previous project can be used in lieu of an original calculation.
 - c) The output from the software shall be compared to the results of the hand calculation with the corresponding answers noted as being equal. Non-rounding errors shall be noted and explained.
2. Textbook or User's Manual Problem
 - a) Software may be validated by running a textbook or user's manual problem with known results.
 - b) The same input assumptions used in the textbook or user's manual problem shall be used in the software being validated.
 - c) The output from the software shall be compared to the results of the textbook or user's manual problem with the corresponding answers noted as being equal. Non-rounding errors shall be noted and explained.
3. Independent Software
 - a) Software may be validated by running the same problem using other, independent software.
 - b) The output from each program shall be compared with the corresponding answers noted as being equal. Non-rounding errors shall be noted and explained.
4. Independent Client
 - a) Software may be validated by providing documentation from a similar public Agency indicating the software is approved for use.
 - b) Software may be validated by providing documentation of where the software was used on a similar project that has been constructed.

Form DCPR-10 may be used to document the results of the software validation. The completed Software Validation Memo, or documentation from an alternate process, shall be filed in the Project files as a Quality Record.

Problems or errors identified during the verification process, during Project use or when announced by the vendor supplying computer program or software shall be documented and reported immediately to the Design Manager. Computer errors identified during Project use shall also be reported to the Design Manager. The Design Manager together with the Design Discipline Lead will assess the impact of the problem or errors on past or current use. The problem or error shall be resolved before continuing use of the specific computer program or software. If the error cannot be resolved, the Design Manager and the Design Discipline Lead shall determine an alternative calculation method.

6.0 REFERENCES

DCPR-06 Checking Input to Computer Programs

DCPR-08 Checking Spreadsheets

7.0 APPROVED COMPUTER PROGRAMS AND SOFTWARE

7.1 The following represents the list of approved industry-standard computer programs and software:

- MathCAD
- spColumn (formerly PCACol)
- APILE
- LPILE
- Shaft 6.0
- MDX
- LEAP Bridge Suite/Enterprise (RC Pier)
- STAAD PRO V8i
- STAAD Foundation
- SAP 2000
- LARSA 4D Bridge +
- LARSA Section Composer
- BRASS Culvert
- STLBRIDGE LFD
- RISA 2d and 3D
- RISA Base
- RISA Foot
- FB-MultiPier
- Response-2000 v1.0.5
- Enercalc – version 6
- Hilti PROFIS Anchors – version 2
- GROUP 3D
- SOFiSTiK
- Response-2000
- XTRACT
- Gint
- Driven
- GRLWEAP
- WEAP
- MSEW
- SLOPE/W
- FLAC
- Unisettle
- SHAKE
- Shake 2000
- QUAKE
- SupportIT
- SNAIL
- SURFER
- GRAPHER
- GeoMotions Suite
- Plaxis 2D and 3D
- ProShake
- CSI Bridge 15
- EnerCALC
- Merlin DASH
- Brass Girder STD
- PDA/CAPWAP
- WinSAF
- WinStress
- Settle 3D
- FB Deep Pier
- FB Multi-Pier
- NSBA Splice
- Power Bridge
- Power Rebar
- RAM Elements
- RM Bridge
- spColumn
- Tedds
- RamsBeam
- RAM Structural System
- AGI 32+
- ESRI ArcView
- ESRI Spatial Analyst
- ESRI 3D Analyst
- HEC GeoRAS
- HEC HMS
- HEC RAS
- HY8
- XPSWMM
- Bentley Microstation
- Bentley InRoads
- InRoads Storm and Sanitary
- Bentley Flowmaster
- Bentley Culvertmaster
- Bentley StormCAD
- CivilStorm
- GeoPak
- Autodesk Civil 3D
- AutoCAD
- AutoTurn 7

- SignCAD
- VISSIM
- Synchro + w/warrants
- McTrans HCS+
- Flo-2D + MapObjects
- ADINA
- SketchUP LAN
- Photometric Toolbox
- Axiom Site License
- Google Earth Pro
- Adobe/Bluebeam
- CUHP
- SWMM
- Virtis (AASHTOWare)
- Trane Trace 700
- ASHRAE Duct-fitting database
- Equest 3.64
- Cook Compute a fan
- SKM Power Tools
- Visual
- Hilti profis anchor
- Simpson strong tie-anchor selector
- Microsoft Office
- WIN-SABRE

7.2 The following represents the list of non-industry standard computer programs and software that have been validated for use on this Project:

- CAMIL
- LCC
- MELL
- COMODE
- ERC95
- SP-NEW
- SecureRisk

8.0 FORMS

DCPR-10 Software Validation Memo

1.0 PURPOSE - To establish the sequence and responsibilities for the Constructability Review (CR) and for a Interdisciplinary Review (IDR) before submission to the Authority for review and comment.

2.0 SCOPE - This procedure applies to design calculations, reports, drawings and specifications submitted for progress review when identified as required on the *Design Development and QC Process Documentation* form.

The CR is an opportunity for the Contractor to provide formal constructability review comment to the design team.

The IDR is an interdisciplinary review to promote and document the coordination between the design discipline teams. The Design Discipline Leads will jointly review the documents for interferences, compatibility between design disciplines, completeness, and will resolve conflicts and suggest improvements based on sound engineering practices

3.0 DEFINITIONS
Not applicable.

4.0 RESPONSIBILITIES

Design Discipline Lead - responsible for initiating and coordinating the review and for final resolution of review comments.

Reviewer - responsible for reviewing the design document and providing comments. In the case of a IDR, the Reviewers determine if incompatibilities exist among disciplines. Additional responsibilities are provided below.

5.0 PROCEDURES - These procedures generally apply to all documents submitted for progress submissions at various intermediate levels of completion.

5.1 CR Procedures:

5.1.1 Actions by the Design Discipline Leader (DDL) or a designated individual:

- Prepares a pdf of the review set.
- Prepares a **Review Comment Form, Form DCPR-4, and Review Cover Sheet, Form DCPR-11** and indicates that it is a CR by checking the CR box on both forms.
- Fills in the review phase portion of the comment sheet. If the document is a Report, indicates whether it is "Draft" or "Final". Indicates the type of Design.
- Provides the documents to the Construction Coordinator.
- Reviews the comments from the Reviewer on the Review Comment Form.
- Consults with the Reviewer to resolve comments for which they are in disagreement.
- Resolves the differences, provides a Response, Status and Date on the QC Comment Review Sheets and/or review set. If the response is that the DDL will provide the information in a future submittal, so indicates as a response, and provides a status code of "O" for Open.
- Incorporates agreed to changes in the design document and presents the revised document

to the Reviewer.

- Signs and dates the Review Cover Sheet. An electronic signature and date may be provided.
- Provides the QC Review Cover Sheet review set, if needed, and updated design documents to the Reviewer for signature and date on the sheet and initials on the Review Cover Sheet indicating final resolution.

5.1.2 Expected Actions by the Constructability Reviewer:

- Review the design documents and provide comments on the Review Comment Form.
- Sign the Review Cover Sheet indicating comments have been provided to the DDL. An electronic signature and date may be provided.
- Resolve comment responses with the DDL.
- Review updates to the design documents, if any, and if updates are acceptable, sign and date the Review Cover Sheet and initial the Review Comment Form indicating final resolution has been reached. An electronic signature and date may be provided. In lieu of hand written initials, the Reviewer may use typed initial as long as they are typed using track changes.

Note: The DDL may continue with the submittal if the Review Cover Sheet is not provided by the reviewer performing the Constructability Review if a Review Comment Form is provided and the reviewer has initialed each comment. The DDL may also continue with submittal if the Constructability Review comments are not received in time to incorporate into the submittal. In this case, the response to the comment will indicate the comment will be addressed prior to the subsequent submittal.

5.2 IDR Procedures:

5.2.1 Actions by the Design Discipline Leader (DDL) or a designated individual:

- Prepares a copy of the review set.
- Prepares a **Review Comment Form, Form DCPR-4, and Review Cover Sheet, Form DCPR-11** for each intended reviewer and indicates that it is a IDR by checking the IDR box on both forms.
- Fills in the review phase portion of the comment sheet. If the document is a Report, indicates whether it is "Draft" or "Final". Indicates the type of Design.
- Identifies the intended reviewer by discipline and by name if known.
- Uploads the review set and forms to ProjectWise.
- Sends a ProjectWise link to each of the intended reviewers.
- Reviews the comments from the Reviewers on the Comment Review Form and/or the review set.
- Consults with the Reviewers to resolve comments for which they are in disagreement.
- Resolves the differences, provides a Response, Status and Date on the Comment Review Form.
- Incorporates agreed to changes in the design document.
- Signs and dates the Review Cover Sheet and presents the revised document to the Reviewers. An electronic signature and date may be provided.
- If the response is that the DDL will provide the information in a future submittal, so indicates

as a response, and provides a status code of "O" for Open.

5.3.2 Actions by the Reviewers:

- Reviews the design documents provided to determine if incompatibilities exist among disciplines.
- Provides comments in the Review Comment Form. Comments may also be annotated on the design documents provided, however, the comment form is the official document for comment resolution and closure.
- Signs and date the Review Cover Sheet and returns the form and comments to the DDL in ProjectWise.
- Notify the DDL that the Review is complete.
- Comments in specifications or reports should have pages tabbed for easy identification.

6.0 FORMS

DCPR-4 Review Comment Form

DCPR-11 Review Cover Sheet

Subject: **CONSTRUCTABILITY REVIEW (CR) AND
INTERDISCIPLINARY REVIEW (IDR)**

Procedure No. **DCPR-11**
Page **4 of 4**
Revision **1**

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1.0 PURPOSE - To establish the sequence and responsibilities for the Quality Control Review (QCR) of design products within a specific discipline.

2.0 SCOPE - The QCR is a review for design approach, suitability, and conformance with design criteria, standards, and Project requirements. The QCR will be performed by an engineer qualified in the discipline and who has not participated in the production of the design element being reviewed.

3.0 DEFINITIONS
Not applicable.

4.0 RESPONSIBILITIES

The Design Lead is responsible for coordinating the review including assignment of the Reviewer. The Design Discipline Lead may perform the QCR.

The Originator is individual with the primary technical responsibility for the design product that is being reviewed.

The Reviewer is responsible for reviewing design product and providing comments. The Reviewer is responsible for coordinating the resolution of comments generated as a result of the QCR.

5.0 PROCEDURES - These procedures apply to documents undergoing a QCR.

5.1 Actions by the Design Discipline Lead:

- Assigns the Reviewer

5.2 Actions by the Originator:

- Prepares a copy of the design product to be reviewed.
- Prepares a Review Comment Form, Form DCPR-4, and Review Cover Sheet, Form DCPR-11. Identifies the type of Review by marking the QCR box.
- Fills in the review phase portion of the comment sheet. If the document is a Report, indicates whether it is "Draft" or "Final". Indicates the type of Design.
- Reviews the comments from the Reviewer on the Review Comment Form and/or the review set.
- Consults with the Reviewer to resolve comments for which they are in disagreement.
- Resolves the differences, provides a Response, Status and Date on the Review Comment Form and/or review set. If the response is that will be provided in a future submittal, so indicates as a response, and provides a status code of "O" for Open.
- Incorporates agreed to changes in the design document.
- Signs and dates the Review Cover Sheet and presents the revised document to the Reviewer. An electronic signature and date may be provided.

5.3 Actions by the Reviewer:

- Reviews the design product provided for approach, suitability, conformance with client's design criteria, standards, and Project requirements.
- Provides comments in the Review Comment Form. Comments may be annotated on the design documents provided, however, the comment form is the official document for comment resolution and closure.
- Signs and dates the Review Cover Sheet and returns the form and comments to the Originator. An electronic signature and date may be provided.
- Reviews the Responses from the Originator on the Review Comment Form and/or the review set.
- If the resolution is the Originator will provide the information for a future submittal, initials the QC Reviewer Approved box on the Review Comment Form.
- If the resolution is the DL is to incorporate the comment prior to the submittal, confirms that the change was incorporated as agreed; initials the QC Reviewer Approved box on the Review Comment Form. In lieu of hand written initials, the Reviewer may use typed initial.
- Signs and dates the Review Cover Sheet. An electronic signature and date may be provided.

6.0 FORMS

DCPR-4 Review Comment Form

DCPR-11 Review Cover Sheet

1.0 PURPOSE - To establish the requirements for Design Quality Audits, including the verification that the quality activities and related results comply with planned arrangements described in the DQCP. Results of these audits shall be maintained as Quality Records.

2.0 SCOPE - This procedure is applicable to all activities comprising the design quality system within the design organization, including its subconsultants. Audits will be performed by the Design Quality Control Manager and/or designee. The procedure also provides for coordination and follow-up of audit findings and recommended corrective actions. The performance of audits in support of the Quality Assurance Program includes the following: Internal Project Audits to determine the compliance of Design Manager, Design Discipline Leaders, and the design team with the QC Program.

3.0 DEFINITIONS

Not applicable.

4.0 RESPONSIBILITIES

Design Quality Control Manager - schedules and leads Quality Audits to ascertain that the overall QC Program is adequate, objective, and effectively implemented.

Design Manager and Design Discipline Leaders - responsible for providing a receptive and cooperative response to the auditor(s) by personnel in their group; and, providing timely access, during the performance of the audit, to pertinent facilities and documents.

Auditor(s) - responsible for planning, scheduling, and conducting the audit(s) in a professional and objective manner and, consistent with the planned audit objectives, minimizing interruptions to normal workflow of the organization being audited. The Auditor(s) is to present evaluations and findings that are valid and supported by specific written requirements of the Quality Assurance Program.

All Project Design Team members - to be familiar with their quality control responsibilities and the checklist items for the audit.

5.0 PROCEDURE

5.1 Periodic Audits

Periodic Audit activities must be planned, documented and conducted in a manner to provide adequate review of the Quality Control procedure requirements. When Periodic Audits are conducted, the activity or discipline to be audited will be notified in advance. An audit kick-off meeting will be scheduled. An Agenda and Audit Form will be provided attendees using forms DCPR-13D and DCPR 13F, respectively. The DQCM will schedule convenient times with the auditee and conduct the audit. When the audit is complete, the DQCM will schedule a preliminary Audit Closeout meeting to discuss findings, if any, and to provide the auditee with the initial observations and the opportunity to provide additional documentation. The DQCM will finalize the audit and prepare a final Audit Report using form DCPR-13E.

Scheduled audits may be supplemented with a Periodic Audit when DQCM suspects that a serious quality control problem exists, and the quality of the deliverables may be in jeopardy.

Personnel conducting audits must not have direct responsibility for performing the activities being audited.

5.2 Scheduled Audits (Review of QC Documentation)

Scheduled audits will be developed on the basis of the schedule activities. Personnel conducting audits must not have direct responsibility for performing the activities being audited. The audits must include, but not be limited to, checking and review documentation and other quality control functions. An Audit checklist will be developed and used during audits to provide objectivity and continuity of audits.

The DQCM will sample the QC Records of the design deliverable. Sampling will be determined by the DQCM based on the size of the submittal package. Small submittals may be reviewed in their entirety. Larger packages will undergo a level of sampling based on the results of previous submittals, complexity of the QC Records, or judgment. The current submittal, or future submittals, may undergo increased sampling rates based on the outcome of the sampling. Once the DQCM has determined that the DCPRs have been implemented, the sampling rate may be decreased.

Form DCPR-13A will be used to document the scheduled audit. At the completion of the audit, and prior to finalizing the audit results, the auditor will present the initial observations to the auditee including presumed non-compliances and provide an opportunity for the Design Manager, Design Discipline Lead, or Project staff to address the findings. The DQCM will review the responses and updated QC documentation against the audit criteria. This process will provide early feedback to the design team related to the proper implementation of the QC procedures. Once the QC documentation meets the audit requirements, the DQCM will close out the audit by completing the Internal Design Quality Audit Checklist (Form DCPR-13A). In this case, Quality Audit Finding Form (Form DCPR-13B) will not be required since nonconformances have already been addressed and closed. A post-audit meeting will not be required since the initial observations have been addressed and Form DCPR-13A has been executed. The auditor may close an audit if the QC Documentation is in substantial conformance to the audit criteria and initiate additional targeted training to address minor nonconformances. In this case, the DQCM may hold a post-audit meeting to relate the need for additional targeted training and required attendees. The targeted training will be documented and kept in the Quality Records. If required, a Quality Audit Finding (Form DCPR-13B) will be used to document the final results of the audit, to address a root cause, including non-compliant issues that require further investigation and corrective action.

Audit activities, including resolution of deficiencies, are documented and retained as quality records to allow the Design Quality Manager to monitor the overall quality audit program. The status of audits and findings will be recorded in the Project data base.

Deficient areas will be re-audited or otherwise verified, subsequent to the completion of a corrective action, to ascertain that corrective measures have been implemented and are effective, before the audit is closed.

6.0 ATTACHMENTS

Form DCPR-13A	Internal Design Quality Audit Checklist
Form DCPR-13B	Periodic Audit Agenda
Form DCPR-13C	Periodic Audit Report
Form DCPR-13D	Periodic Audit Form

1.0 PURPOSE – The purpose of this DCPR is to define the QA/QC processes associated with preparing As-Built Documents.

2.0 SCOPE – As-built drawings are necessary to document the as-constructed work in the field. They are intended to identify constructed items that did not generally meet the Issued as Readiness for Construction documents including materials and equipment as specified.

2.1 DEFINITIONS

As-Built Document – a document that is created to reflect the actual construction condition that is different than the design shown on the latest Issued as Readiness for Construction drawing.

Issued as Readiness for Construction Document – a document that has been accepted by the Authority and Issued as ready for construction by the Design Team.

Updater – the individual who updates the design file based on approved as-built information.

3.0 RESPONSIBILITIES

Updater – the Updater is responsible for incorporating design changes and initiating the checking process.

Design Manager (DM). Responsible for coordination with the design team to incorporate red line drawings provided by the construction team.

Design Discipline Lead (DDL) - Will provide the changes to the Updater and Check that the changes have been incorporated correctly.

Quality Manager (QM) – for each Design Unit, including all components will certify that all non-conformance reports are addressed and resolved, the Project has been designed and constructed in accordance with Contract requirements, and the As-Built Plans comply with the Contract requirements.

4.0 PROCEDURE

Changes to As-Built drawings will be tracked by the Design-Builder. The Corrective Action processes defined in DCPR-15 and Notice of Design Change processes defined in DCPR-09 will be followed for any change that has a significant impact on the design or design process.

The procedure for the checking of As-Built Document will generally follow the steps described in DCPR-05.

The Updater will incorporate approved changes to the latest Issued as Readiness for Construction design file based on approved as-built information. The Updater will print the revised sheet, affix a QC Stamp, indicate that the sheet is an As-Built check sheet by indicating “As-Built Check Sheet” in the top line of the QC Stamp, number and date the QC Stamp, initial and date the “Originator” line on the QC Stamp and provide to the DDL for checking.

The DDL will perform the checking of the document, initial and date the “Checker” line on the QC Stamp and return the check prints to the Updater. If additional changes are required, the Updater will incorporate the changes, initial and date the “Updater” line on the QC Stamp, print a corrected sheet and provide the corrected sheet and the check print to the DDL for verification.

When the Updates are completed and checked, the DDL will present the As-Built package consisting of the QC documents, As-Built Plans and associated non-conformance reports, to the QM for review. Upon

review of the design package, the QM will document the certification as per the process provided in the QP.

4.1 Field Verification – The Design Team will not provide field verification or review of as-built documents.

5.0 Forms

See Quality Plan

1.0 PURPOSE – This procedure identifies the responsibilities and describes the process for identifying, tracking, resolving and reporting conditions adverse to Quality. This process includes a method for tracking conditions adverse to quality from the time of discovery through resolution and verification corrective action measures. This procedure is applicable to activities which affect the quality of processes performed by the Design Team.

2.0 DEFINITIONS

Condition adverse to Quality – an all-inclusive term used in reference to the following: failures, malfunctions, deficiencies defective items, and non-conformances.

Corrective Action – Measures taken to rectify conditions adverse to quality and to preclude recurrence where necessary.

Preventive Action – Measures taken to preclude conditions adverse to quality.

Root Cause – The most basic reason for the condition, which, if eliminated or corrected would have prevented the condition from occurring.

3.0 RESPONSIBILITIES

The Design Manager (DM) shall assure the cooperation and the appropriate degree of responsiveness of each responsible organization requested to provide effective corrective action.

The Design Quality Control Manager (DQCM) shall be responsible for the implementation of this procedure and for assuring that conditions adverse to quality are properly identified, documented, reported, evaluated and verified prior to closure. The DQCM will investigate to determine the extent of the condition and recommend the effective corrective action measures to be implemented.

4.0 PROCEDURES

4.1 General

Conditions adverse to quality may be reported to the DM and the appropriate Design Discipline Lead.

Conditions adverse to quality require action to prevent recurrence, investigation and evaluation regarding similar work, and a root cause determination. Each condition will be tracked from its identification to verification of the completion of all corrective action measures and closure. Form DCPR-15A Corrective Action Request will be used to document the corrective action process. The status of each corrective action will be entered and maintained on the Corrective Action Status Log, form DCPR-15B.

Corrective action shall extend to the performance of subconsultants. Corrective action measures shall emphasize root cause determination and steps taken for prevention of recurrences.

The DQCM may use preventive actions to facilitate, in part, continuous improvement or to prevent a condition adverse to quality. Feedback from the design team, Design-Builder or management will be used to identify opportunities for improvement. When opportunities for improvement are identified, formal and informal meetings may be used to communicate such opportunities. Preventive Actions may be communicated by the DQCM using Preventive Action e-mails or during Design Team meetings, for example.

4.2 Corrective Action Process

The DQCM may identify the adverse condition during an audit, surveillance or while performing normal work activities. The DQCM will inform the DM of the adverse condition, when applicable. The DQCM will document the adverse condition by completing Form DCPR-15A Corrective Action Request and entering Corrective Action Number into form DCPR-15B Corrective Action Status Log.

Following review and Corrective Action number assignment, the DQCM will inform the appropriate person of the Corrective Action request, collaborate to determine a root cause and corrective action, identify other affected individuals if appropriate, and determine a projected completion date.

The DQCM will implement the corrective action, verify the action was successful, close the Corrective Action Request and update the Corrective Action Status Log.

The status of Corrective Actions will be addressed in Management Reviews, as applicable.

4.3 Preventive Action Process

The DQCM, or other management staff, may identify a potential QC process nonconformance or opportunity for improvement. The need for a preventive action may arise out of an audit. The DQCM may also receive a request for a clarification of a process or procedure from the Design Team or Independent Quality Assurance Manager. When the need to communicate a Preventive Action occurs, the DQCM will determine a course of action and will distribute the preventive action or process clarification via a "Preventive Action" e-mail to the Design Discipline Leads. Preventive Action e-mails will be stored in ProjectWise. The effectiveness of the Preventive Action will be assessed by the DQCM during subsequent Reviews of QC Documentation or other design QC activity, as applicable. If required, the DQCM re-issue the Preventive Action e-mail or commence with a Corrective Action if required in his judgment. A log of Preventive Actions may not be kept at the discretion of the DQCM since "Preventive Action" e-mails will be stored in ProjectWise.

The status of Preventive Actions will be addressed in Management Reviews, as applicable.

5.0 FORMS

Form DCPR-15A Corrective Action Request

Form DCPR-15B Corrective Action Status Log

1.0 PURPOSE – The purpose of this DCPR is to define the QA/QC processes associated with using two different software programs in parallel to develop comparable output and determine if it is correct for use as input into another software program or design process.

2.0 SCOPE – This procedure identifies the requirements for checking the input used by parallel software programs, comparing the output and resolving differences in the output. Output from a software program is determined to be correct when it is reasonably equal to the output of another software program when either program could be used for design purposes.

2.1 Definitions

Parallel Software Programs – Two different computer software programs used to produce an analytical model and create output that is then compared for correctness.

3.0 RESPONSIBILITIES

Design Discipline Lead (DDL) – Will determine which two software programs will be used to produce parallel results.

Design Quality Control Manager (DQCM) – Will verify during the Review of QC Documentation that the two software programs used are on the approved software list, the data used as batch input has been checked, and that the model output comparison has been checked.

Input Checker – Responsible for checking the data used as batch input to the parallel software programs. The Input Checker cannot be the Input Originator.

Input Originator – Responsible for creating the design inputs that will be used by the parallel software programs.

Output Checker(s) – Responsible for evaluating the output data for correctness and judging by experience if values are within range. Will determine what values will be used as input to subsequent design processes. The Output Checkers may be the Program Originators.

Program Originators – Responsible for incorporating the design inputs into the parallel software programs. The Input Originator can also act as the Program Originator for one of the software programs.

4.0 PROCEDURES

4.1 QC Procedure

Step 1: The Input Originator will create data containing model input that Program Originators will manually load into the two parallel software programs. When the Input Originator deems this data is ready to be checked, the Input Originator will initiate the appropriate checking procedure. DCPR-03 Checking Calculations will be used when input data is developed by hand calculation methods and DCPR-08 Checking Spreadsheets will be used when input data is developed by spreadsheets.

Step 2: When the checking of input data is complete and comments, if any, are resolved, the data will be provided to the Program Originator(s). The Program Originator(s) will run the parallel software programs using the input data developed by the Input Originator and will produce a comparison table of the parallel results..

Step 3: The Program Originator(s) or Output Checkers will review the input and if there are large discrepancies make required changes to bring the results within a reasonable range.. Results that are within the acceptable range in the judgment of the Program Originator(s) or Output Checkers are considered to be correct and suitable for subsequent use.

Step 4: The Program Originators or Output Checkers will document the comparison of parallel results following DCPR-03 if hand calculations are performed to summarize the model output and/or DCPR-08 if spreadsheets are used to summarize the model output. Once the comparisons of parallel results are checked, the Program Originators or Output Checkers provide the results to the DDL for use in design.

Step 5: The DDL will provide the summary of results to subsequent users for use in design. The subsequent users will follow DCPR-06 Checking Input to Computer Programs to verify the demands have been correctly input into the program used for design and that the output is reasonable.

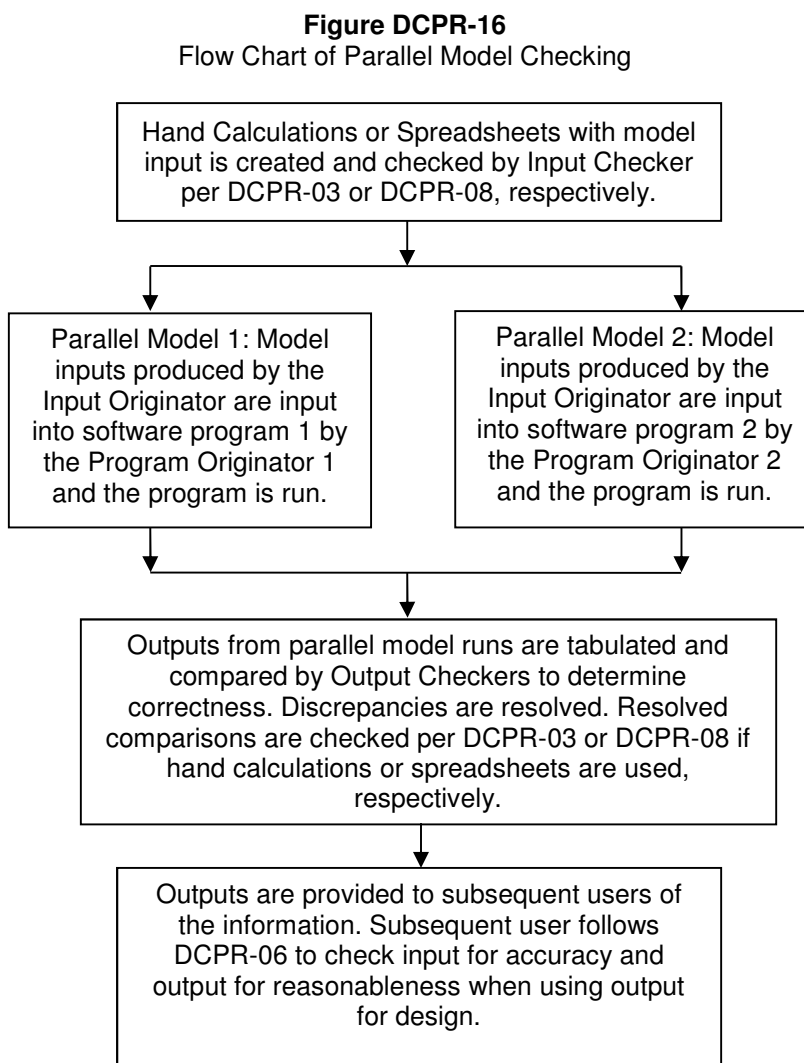
The QC documentation created above will be provided to the DQCM during the Review of QC Documentation described in DCPR-13 Internal Design Quality Audits.

4.2 QA Procedure

The DQCM will perform the Review of QC Documentation described in DCPR-13 Internal Design Quality Audits of the documents produced in Section 4.1 above prior to submitting the package to the DQAM.

5.0 REFERENCES

DCPR-03 Checking Calculations
DCPR-06 Checking Input to Computer Programs
DCPR-08 Checking Spreadsheets
DCPR-13 Internal Design Quality Audits
Figure DCPR-16 Flow Chart of Parallel Model Checking



1.0 PURPOSE – The purpose of this DCPR is to define the QA/QC processes associated with issuing Readiness For Construction (RFC) packages.

2.0 SCOPE – The purpose of this DCPR is to define the QA/QC processes associated with the Readiness For Construction design phase. It includes requirements for reviewing the RFC packages, closing review comments and Non-Conformance Reports (NCRs), and signing and sealing documents.

3.0 RESPONSIBILITIES

Design QA Manager - Signs the title sheet for the drawings, certifying to the following:

1. Design checks have been completed;
2. Work conforms to Contract requirements;
3. Any deviations or design exceptions have been approved in writing by the Agencies;
4. Design QC/QA activities are following the Design-Builder's Quality Plan; and
5. All outstanding issues or comments from previous Design Reviews have been resolved;
6. All Design Non-Conformance Reports have been satisfactorily addressed and resolved.

Design Manager - Certifies in writing that the design is complete to the appropriate level or stage of review, checked and ready to be released for construction. The DM signs the title sheet to the drawings certifying to the items contained in DB §111-1.4 (A)-(H).

Design QC Manager – Reviews RFC package for DQCP compliance prior to DM certification.

Responsible Engineer/Architect - Each sign all drawings prepared under his or her direction.

Agencies - Provide consultation and written comment regarding the design and applicable Work Zone Traffic Control, temporary erosion control measures, and environmental requirements.

4.0 PROCEDURES

The Readiness For Construction (RFC) package will be prepared following the Final Design or Early Construction Start Design depending on the Design Unit. The process for developing and submitting RFC packages is as follows:

- Any outstanding comments, internal or external, from previous design reviews will be resolved and incorporated in the RFC set. This includes comments received from the ECS or Final Design submittal, or deferred comments from the Interim or Definitive Design as appropriate.
- In general, additional Quality Control Reviews (CR/IDR/QCR/IAC) will not be conducted for the RFC submittal unless significant changes are made after the ECS/Final submittal. A Detailed Check (see Section 1.8.1) of the RFC package will typically be conducted to verify incorporation of previous review comments. This check will be resolved and documented as per Section 1.8.1 and the related DCPR documents.
- The Design-Builder will schedule a Readiness For Construction review with the Agencies as per DB §111-8.5.

- The Responsible Engineer/Architect will review the RFC package prior to signing and affixing his or her stamp to each sheet or document. For those drawings and documents included in the submittal that are prepared by a manufacturer or supplier or other Persons not under their direct supervision, the Responsible Engineer and/or Responsible Architect (as appropriate) shall affix a stamp that indicates the design shown on the sheet or document conforms to the overall design and Contract requirements.
- Following the completion of all checks and reviews and the signing/sealing of the RFC package, the DQCM will review the package for completeness and compliance with DQCP requirements. The DQCM will review the list of NCR's to confirm that any previous non-conformances have been satisfactorily addressed in the RFC set. The DQCM will document the results of this review as a scheduled audit (see DCPR-13). Upon satisfactory resolution of the scheduled audit, the DQCM will notify the DM that the RFC package is ready for DM review and certification.
- The Design Manager will review the package for Contract compliance and completeness. This review will verify that:
 - Design has undergone constructability review and is constructible as represented,
 - Working Plans, Project Specifications and related documents for the portion of the Project to be constructed are complete and checked in accordance with this DB §111-11, and
 - The design and drawings for Work Zone Traffic Control and temporary erosion control and environmental measures applicable to the Work are complete.
- The DM will certify the package in writing and will sign the title sheet to indicate the requirements have been met.
- Following DM review and certification, the RFC package will be provided to the Independent QA Engineering Firm for QA review. The QA review will include verification that all NCR's have been addressed. The DQAM will also be required to sign the title sheet of the drawings as certification to the items listed in Section 3.0 of this DCPR.
- The signed and sealed RFC package along with all written certifications will be submitted to the Agency as per the Document Control Plan.
- Any changes to RFC documents are to be handled as per DCPR-09 Revisions to Readiness For Construction Documents.

5.0 REFERENCES

DCPR-02	Checking Reports and Studies
DCPR-03	Checking Calculations
DCPR-05	Checking Drawings
DCPR-06	Checking Input to Computer Programs
DCPR-07	Checking Specifications
DCPR-08	Checking Spreadsheets
DCPR-09	Revisions to Readiness For Construction Documents
DCPR-11	Constructability Review (CR) and Interdisciplinary Review (IDR)
DCPR-12	Quality Control Review (QCR)
DCPR-13	Internal Design Quality Assurance Audits

Subject: ***Readiness For Construction (RFC)***

Procedure No. ***DCPR-17***

Page ***3 of 2***

Revision ***1***

APPENDIX C

Quality Control Forms

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Current QC Forms are stored in ProjectWise at the following location:

**[pw:\\pwtzhrc:TZ HRC\Documents\Tappan Zee Bridge\16.00
Design Quality Control Plan\16.03 QC Forms and Tools\](#)**

Copies of the forms are included in Appendix C for reference only.

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QC Process Documentation Form

Owner: NYSTA

Date: _____

Project: TZHRC

DPI: _____

Document Considered: _____

Responsible Professional(s): _____

Initials: _____

Design Discipline Lead(s): _____

Initials: _____

Design Manager: Kenneth J. Wright, PE

Initials: _____

Design Quality Control Manager: Daniel E. Domalik, PE

Initials: _____

Design Package Status:

- ☐ Definitive
☐ ECS
☐ Interim
☐ Final
☐ RFC

Temp Facility & Demo

Package Status:

- ☐ Conceptual
☐ Pre-Definitive
☐ Definitive
☐ Pre-Final
☐ Final
☐ RFC

Perm Facility Package Status:

- ☐ Informal Conceptual
☐ First Concept
☐ Second Concept
☐ Preferred Concept
☐ Pre-Definitive ☐ Pre-Final
☐ Definitive ☐ Final
☐ Interim ☐ RFC

Checking of Reports and Studies Required?

☐ Yes ☐ No

Checking of Calculations Required?

☐ Yes ☐ No

Checking of Drawings Required?

☐ Yes ☐ No

Checking of Spreadsheet Required?

☐ Yes ☐ No

Checking of Input Required?

☐ Yes ☐ No

Checking of Specifications Required?

☐ Yes ☐ No

IAC Required?

☐ Yes ☐ No

Load Rating Required?

☐ Yes ☐ No

Constructability Review Required?

☐ Yes ☐ No

Quality Control Review Required?

☐ Yes ☐ No

Interdisciplinary Review Required?

☐ Yes ☐ No

Name: _____

Name: _____

Interdisciplinary Reviewers:

- ☐ Approach Structures
☐ Systems / Lighting / Security / ITS / Tolling
☐ Main Span
☐ Environmental
☐ Facilities
☐ Foundations / Geotechnical
☐ Miscellaneous Structures
☐ Highway
☐ Potential Future Load
☐ Visual Quality / Landscape Architecture
☐ Other _____

Delegate or Additional

N/A

Robert LaMagna

Michael Whalen

Chris Scollard

John Duschang

Harry Nagy

Tom Cooling

Elana Freedman

Michael MacNeil

Milos Vasiljevic

John Tarantino

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Form DCPR-03
Calculation Cover Sheet

Client: _____

Project: _____

Project Number: _____

Calculation No: _____ Rev. _____

Title: _____ Page ____ of ____

Purpose:

Originator: _____ Date: _____

Checked By:

Print Name: _____ Date: _____

Sign Name: _____

Verified By:

Print Name: _____ Date: _____

Sign Name: _____

Supersedes Calculation No.: _____

Superseded by Calculation No.: _____

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TAPPAN ZEE
CONSTRUCTORS, LLC

Form DCPR-4 – REVIEW COMMENT FORM

Owner: NYSTA DPI: _____
 Project: TZHRC Date: 4/1/2013
 Document Considered: _____ Review Type: ☐IDR ☐CR ☐QCR ☐IAC ☐Other
 Design Manager: Ken Wright, P.E. Project Phase: Definitive
 Design Discipline Lead(s): _____ Reviewer: _____
 Responsible Professional(s): _____ Page: 1 of 2

Sheet/ Page No.	Comment No.	Reviewer Comment	Responsible Professional Response	Status ¹	Date	Reviewer App'd

(1) Status code: C = complied in this submittal; R = complied w/ agreed upon revisions; D = Deleted; O = Open; F = Deferred until next submittal

Rev 1

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Form DCPR-09
Notice of Design Change
TZHRC DESIGN-BUILD PROJECT

Initiated By:

DESIGN ENGINEER: _____

NDC NO.: _____

Note:

Initial submittal of this form serves as notice to the Tappan Zee Constructors (TZC) that revisions are in process and proceeding with construction without revised plans is at the contractor's risk and could result in removal of the items constructed. Contact the engineer immediately before proceeding with construction. Complete the ACKNOWLEDGEMENT block on the lower left.

REASON FOR CHANGE <input type="checkbox"/> Design Change <input type="checkbox"/> Design in progress <input type="checkbox"/> Conflicting design elements <input type="checkbox"/> Conflicting with existing features <input type="checkbox"/> Other	Response to RFI No.	
	Response to Submittal No.:	
	Value Engineering:	
	Other:	
DESCRIPTION OF REVISION:		
DRAWING / SPECIFICATION TO BE REVISED:		
PLAN SET TO BE REVISED:		
ESTIMATE OF DELIVERY OF RFC PLANS:		
ATTACHMENTS:		
ACKNOWLEDGEMENT		
		ROW Impacts? <input type="checkbox"/> Y <input type="checkbox"/> N Env. Impacts? <input type="checkbox"/> Y <input type="checkbox"/> N Potential Contract Change? <input type="checkbox"/> Y <input type="checkbox"/> N
Design Discipline Lead	Date	
Design Manager	Date	
TZC Design / Construction Coordinator	Date	
Return to: <input type="checkbox"/> TZC Design/Const. Coord. <input type="checkbox"/> Design Manager <input type="checkbox"/> Design Discipline Lead		

COPY DISTRIBUTION:

☐ File ☐ Authority ☐ TZC

Rev 1

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Form DCPR-10
Software Validation Memo



Software Validation Memo

To: {Name}, Design Quality Control Manager	
From: [Click here and type name]	Project: Tappan Zee Hudson River Crossing
CC:	
Date: [Click here and type date]	File Folder: 16.11_ Validated Software
RE: Software Validation for [Click here and type subject]	

Objective of the Validation

Description of Engineering Calculation Software and Hardware setup

Validation Method

Results and Conclusion

Notes:

- *Subconsultants shall modify this form to be on their company letterhead. The body of the memorandum shall remain unchanged.*
- *Attach input and output printout for each validation. The output printout should include hand notes comparing results to standard or known output*
- *Photocopies of standard examples from textbooks or software manuals are acceptable for the standard or known output.*
- *Attach vendor quality control/assurance certification in lieu of input/output if applicable.*

cc: {Name}, Design Manager
Project file: 16.11_ Validated Software

Rev 0

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Form DCPR-13A
INTERNAL DESIGN QUALITY AUDIT CHECKLIST Page 1 of ____
TZHRC D-B PROJECT

DESIGN PACKAGE AUDIT NO.: _____

AUDIT STAGE: ☐ _____ Submission (Concept, Definitive, Interim, Final)
☐ Post - Final Package Review (Readiness for Construction Certification Process)

AUDITOR: _____ DATE(S) OF AUDIT: _____

NAME OF FIRM AUDITED: _____

NAME OF RESPONSIBLE PARTY (DDL, DM, Task Leader, etc.): _____

PROJECT SEGMENT/ TASK / ITEM(s) AUDITED: _____

	AUDIT ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS		REMARKS
				YES	NO	
1.	Plan reviews completed? CR, IDR, QCR?	DCPR-11, DCPR-12	Review package to verify that comment sheets are attached.	_____	_____	_____
2.	Are calculation check prints available?	DCPR-03	Review originals and check prints	_____	_____	_____
	Independent Analytical Check	DCPR-04	Review Final Structure Calculations	_____	_____	_____
	Structures Load Rating	DCPR-03	Prior to RFC; Detail design check	_____	_____	_____
3.	Is checking of computer input being accomplished?	DCPR-06	Review originals and check prints	_____	_____	_____
4.	Is checking of Spreadsheet verified?	DCPR-08	Review check prints.	_____	_____	_____

Form DCPR-13A
INTERNAL DESIGN QUALITY AUDIT CHECKLIST Page 2 of ____
TZHRC D-B PROJECT

	AUDIT ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS		REMARKS
				YES	NO	
5.	Are drawing check prints (redlines) available?	DCPR-05	Review record set and check prints.	_____	_____	_____
6.	Are check prints of specifications available?	DCPR-07	Review record set and check prints.	_____	_____	_____
7.	Are procedures for marking up check prints being followed?	DCPR-03, 05	Review check prints or redlines.	_____	_____	_____
8.	Are record prints properly signed and dated?	DCPR-03, 05	Review record set QC Stamp.	_____	_____	_____
9.	Were calculations checked prior to drawing checking?	DCPR-03	Review record sets & dates.	_____	_____	_____
10.	Are current design changes incorporated?	DCPR-09	Review Notice of Design Change Log & revision block in dwg(s).	_____	_____	_____
11.	Are Quality Review prints and/or comments available?	DCPR-11, 12	Review documentation of CR, IDR, and QCR Reviews.	_____	_____	_____
12.	Are all review comments addressed or incorporated in the final documents?	DCPR-11, 12	Review documentation of CR, IDR, and QCR Reviews.	_____	_____	_____
		DQCP 1.4.2	Review Authority Comment Logs.	_____	_____	_____
13.	Has procedure for checking Reports been followed?	DCPR-02	Review record set and check prints.	_____	_____	_____

Form DCPR-13A

INTERNAL DESIGN QUALITY AUDIT CHECKLIST Page 3 of ____

TZHRC D-B PROJECT

	AUDIT ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS		REMARKS
				YES	NO	
14.	Have Design Checklists been prepared?	DQCP 1.5.1	Review checklists.	_____	_____	_____
15.	Third-party comments	DQCP 1.4.2	Review Comments	_____	_____	_____
16.	DM Certification	DQCP 1.5	Review Form	_____	_____	_____
17.	Other:			_____	_____	_____

ADDITIONAL COMMENTS ATTACHED []

AUDIT FINDINGS ATTACHED []

CERTIFICATIONS

This checklist is, to the best of my knowledge, a true and accurate assessment of QC activities and compliance of the Design Package submitted, by:

_____, Auditor Date: _____

Form DCPR-13A

INTERNAL DESIGN QUALITY AUDIT CHECKLIST Page ____ of ____

TZHRC D-B PROJECT

ADDITIONAL COMMENTS:



Form DCPR-13B

Periodic Audit Agenda

TAPPAN ZEE HUDSON RIVER CROSSING PROJECT
Contract D214134
PIN 8TZ1,00
Project TA#: TANY 12-18B

Meeting Date:

Start Time – Estimated Completion Time:

Location of Meeting:

Meeting Leader:

Agenda:

	Topic(s)	Discussion Leader
	<ol style="list-style-type: none">1. Introductions2. Scope and Objectives3. Methods and Procedures4. Document Location, Personnel, Access5. Tentative Exit Meeting Date and Time6. General Discussion	

Attachments:



Form DCPR-13C
Periodic Audit Report

TAPPAN ZEE HUDSON RIVER CROSSING PROJECT
Contract D214134
PIN 8TZ1,00
Project TA#: TANY 12-18B

Audit Number:

Audit Date:

Preamble

{text}

Findings

{text}

	Total Audit Items	Conforming	OFI	Deficient	Comments
Audit Items					

Summary and Conclusion

{text}



Form DCPR-13D
Periodic Audit Form

TAPPAN ZEE HUDSON RIVER CROSSING PROJECT
Contract D214134
PIN 8TZ1,00
Project TA#: TANY 12-18B

Lead Auditor: _____ **Lead Responder:** _____

Audit #: _____ **Audit Date:** _____ **Audit Time:** _____ **Location:** _____

Item #	Reference	Requirement	Objective Evidence	Method of Verification	Status	Comments
1						
2						
3						
4						
5						
6						

Method of Verification Code: I = Interview R = Review

Status Codes: C = Compliance OFI = Opportunity for Improvement D = Deficiency

Rev 0

**Form DCPR-15A**
CORRECTIVE ACTION REQUEST

AUDITED ITEM/ DESIGN PACKAGE NO.:		AUDIT NO.:
AUDITOR:		CHECKLIST ITEM NO.:
DATE(S) OF AUDIT:		REFERENCE:
REQUIREMENT:		
FINDING:		
FINDING ACKNOWLEDGED BY:		DATE:
ROOT CAUSE ANALYSIS:		
RECOMMENDED CORRECTIVE ACTION:		
SCHEDULED COMPLETION DATE:	CORRECTIVE ACTION RESPONSIBILITY ASSIGNED TO:	
CORRECTIVE ACTION TAKEN:		
CORRECTIVE ACTION COMPLETION DATE:		
SIGNATURE:		
(To determine if Refresher Training, for example, was effective, verification to occur on a subsequent submittal)		
CORRECTIVE ACTION VERIFIED BY:		DATE:
COMMENTS:		



Form DCPR-15B

Corrective Action Status Log

CAR Number	Date of Issue	Subject	Responsible Party	Root Cause Determined by Date	Proposed Completion Date	Date of Verification and Closure

NYSTA Contract No. D214134

PROJECT AREA (*Approach Structures, Highway, Bridge Systems, Facilities, Security, Main Span, Geotechnical, Environmental*)
(*Conceptual, Definitive, ECS, Interim, Final, RFC*) **DESIGN SUBMITTAL**

Submitting Organization:

Design Builder: Tappan Zee Constructors, LLC (TZC)
Subcontractors: HDR

DESIGN UNIT
PACKAGE NAME
COMPONENT NAME

Status: Submitted for XXXX
Category: In Progress Design

Rev. No.	Design Package ID and Description	Date
#	Description	XX/XX/XXXX

Signature: _____
HDR Design Manager / Design Director

Having evaluated this item of Contract Data, I hereby certify that it satisfies the Contract requirements, except as specifically indicated.

Rev 2

APPENDIX D

Quality Control Activities Matrix

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Quality Control Activities Matrix

Review / Submittal	Detail Check	CR	IDR	QCR	IAC ⁽¹⁾	Load Rating	
Temporary Facilities and Demo Package							
Conceptual	X						
Definitive	X	X	X	X			
Final	X	X	X	X			
RFC	X						
Permanent Facilities							
Informal Concept	X						
First Concept	X						
Second Concept	X	X	X	X			
Preferred Concept	X		X	X			
Definitive	X	X	X	X			
Interim	X		X	X			
Final	X	X	X	X			
RFC	X						
Early Release							
Definitive	X	X	X	X			
Early Construction Start	X	X	X	X	X	X	
RFC	X						
Final Design							
Conceptual	X						
Definitive	X	X	X	X			
Interim	X	X	X	X			
Final	X	X	X	X	X	X	
RFC	X						

Notes:

(1) Critical structural members only. See Section 1.5.6.

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Design Quality Assurance Plan

for the

Tappan Zee Hudson River Crossing Project

Contract D214134
PIN 8TZ1.00
Project TA#: TANY 12-18B

Revision 0
February 19, 2013

Prepared by
Greenman-Pedersen, Inc.
80 Wolf Rd., Suite 300
Albany, NY 10591

Emil E. Skoglund, P.E.
Design Quality Assurance Manager

Revision No.	Design Package No. or Description	Date
Rev 0	Initial DQAP	02/19/2013

DQAM Signature: _____

Having reviewed this Design Quality Assurance Plan, I hereby approve its submittal to the Authority.



Acronyms

CADD	Computer Aided Drafting and Design
CAR	Corrective Action Request
CQMP	Construction Quality Management Plan
CR	Constructability Review
DA	Design Assessment
D-B, DB	Design-Builder
DCE	Authority's Design Compliance Engineer
DCM	Authority's Design Compliance Monitor's
DQAPR	Design Quality Assurance Procedure(s)
DCPR	Design Control Procedure(s)
DD	Definitive Design
DDL	Design Discipline Lead
DM	Design Manager
DQAM	Design Quality Assurance Manager
DQAP	Design Quality Assurance Plan
DQCM	Design Quality Control Manager
DQCP	Design Quality Control Plan
DR	Design Review
IAC	Independent Analytical Check
IDR	Interdisciplinary Review
MR	Management Review
NCN	Nonconformance Notices
NYSDOT	New York State Department of Transportation
NYSTA	New York State Thruway Authority
QA	Quality Assurance
QAEF	QA Engineering Firm



Tappan Zee Hudson River Crossing Project
Design Quality Assurance Plan

QC	Quality Control
QCR	Quality Control Review
QM	Quality Manager
QMO	Quality Management Oversight
QP	Quality Plan
QMS	Quality Management System
RFC	Readiness for Construction
TWG	Technical Work Group



Definitions

Authority's / Agencies' Oversight - the Agencies' have specified roles in project monitoring, auditing and verification referred to generally as project Oversight. Their role is described in detail in the Design Build Contract Request for Proposal (RFP) in: Part 2-DB 11, DB 112 and DB 113 and in Part 3, Section 2- Project Management. See also **Oversight** in this list of definitions.

Backchecker – A Design Team member with technical knowledge and qualifications necessary to agree or disagreement with edits proposed by the Checker. The Backchecker is generally the Originator.

Checker – A Design Team member with technical knowledge and qualifications necessary to serve as the Originator for the work element being checked, e.g. calculations, drawings or reports.

commissioning -A systematic quality assurance process to ensure that all highway, bridge and building systems, including mechanical, electrical, plumbing and HVAC systems, are properly integrated and perform according to the design intent and Contract requirements.

Constructability Review – A review conducted by Tappan Zee Constructors Joint Venture construction personnel to assess the constructability of a particular Design Package.

Critical Structural Member - Main load-carrying member that would have a significant negative impact on the integrity of the structural system if its capacity or function was compromised

Design Assessment – Also known as a Quality Control Review; Part of the Independent Design Check; A review of design documents for general compliance with contract requirements.

Design Builder – The contractor partners that have formed Tappan Zee Constructors.

Design Compliance Engineer – Authority's Design Compliance Engineer, responsible for assisting the authority with its oversight role. The Agencies' Design Compliance Engineer (DCE) shall have direct access to the Design QA Manager.

Design Control Procedures – Procedures defined in this Design Quality Plan that provide specific instruction on the implementation of quality control and quality assurance requirements.

Design Discipline Lead – Individual(s) responsible for the overall coordination and management of the design functions related to a specific discipline of engineering.

Design Quality Control Plan – The collection of processes and procedures developed by the Design Quality Control Manager to define the design quality control and internal design quality assurance requirements for the Project.

Design Quality Assurance Manager – The individual tasked with overall responsibility for establishing, implementing, monitoring and reporting on the design quality assurance system.

Design Quality Control Manager – The individual tasked with overall responsibility for establishing, implementing, monitoring and reporting on the design quality control and internal design quality assurance system.

Design Checks, Certifications and Reviews- The Designer's organization shall check all design documents (drawings, plans, specifications, calculations and reports) produced by the Design-BUILDER's organization. The Design QA Manager shall certify that these documents have been checked per Contract requirements and the Design-BUILDER's Quality Plan prior to Design Reviews. The Design QA Manager shall provide the written certification specified in DB 111-11.



Design Team - HDR and its design subconsultants.

Independent Design Check – The check of the design of permanent components, major temporary components, and effects of temporary components by senior personnel who are independent of the production of the work being reviewed. Consists of Design Assessments and/or Independent Analytical Checks.

Independent Analytical Check – Part of the Independent Design Check; A method of quality control using separate calculations (and without reference to Designer's calculations) to establish the structural adequacy and integrity of critical structural members.

Interdisciplinary Review – A review of a particular discipline's design by other disciplines to promote consistency and eliminate conflicts among disciplines.

Originator – A Design Team member who generates a design product, e.g. calculations, drawings or reports. The Backchecker does not have to be the Originator

Project - The meaning as defined by Tappan Zee Hudson River Design-Build Project; Contract D214134; PIN 8TZ1,00; Project TA#: TANY 12-18B.

QA Engineering firm- Greenman-Pedersen, Inc. (GPI) is the independent engineering consultant retained by the Design-Builder responsible to oversee, manage, certify and perform design and construction QA activities. The QA Engineering Firm (and any firm (s) acting as a subconsultant to the QA Engineering Firm) shall not be owned by or be an affiliate of the Design-Builder, any Principal Participant, the Designer or any construction subcontractor. The QA Engineering Firm shall be responsible for management and scheduling of all QA activities for all items of Work for this Contract.

Quality – Conformance to requirements.

Quality Control Activity – Any of the tasks identified on the Project Check Print Stamp; performing tasks associated with an Interdisciplinary or Quality Control Review; or, responding to and/or incorporating comments generated during a Constructability Review.

Quality Control Review – A peer-level review for design approach, suitability, conformance with clients' design criteria, standards, and Project requirements.

Quality Management Plan – The overall quality management document prepared by the Tappan Zee Constructors Joint Venture to define quality control and quality assurance activities for the Project, of which the Design Quality Control Plan is a component.

Oversight – Actions by the Agencies to satisfy themselves that the design-Builder is designing, constructing and managing the Work in accordance with the Contract Documents. It includes actions identified in the Contract Documents by the terms Independent Assurance, Verification Sampling and Testing, compliant/compliance, accept/acceptance, inspect/inspection, audit, confirm, review, verify or terms of similar import. Agencies' comments as a result of Oversight are conveyed to the design-Builder through consultation and written comment. Neither the activity of Oversight nor the lack of consultation and written comment on the part of the Agencies shall be construed to relieve the Design-Builder and its organization from the responsibility and costs for meeting all Contract and regulatory requirements.

Readiness for Construction – The designation assigned to construction documents that have been approved by the TZC Joint Venture.

Rechecker – A Design Team member with technical knowledge and qualifications necessary to determine if edits proposed by the Checker and agreed to by the Backchecker have been properly incorporated into the design product, e.g. calculations, drawings or reports, by the Updater. The Rechecker is generally the Checker.



Tappan Zee Hudson River Crossing Project
Design Quality Assurance Plan

Updater – A Design Team member with technical knowledge and qualifications necessary to incorporate edits, agreed to be incorporated by the Checker, into the design product, e.g. calculations, drawings or reports. The Updater may be the Originator and/or Backchecker.

Working Plans – those plans prepared by the Design- Builder to supplement Design Plans to specify additional details and procedures for construction of the Project.



Contents

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1.2	Design Quality Assurance Objectives	12
1.3	Design Quality Assurance Organization / Personnel.....	12
1.4	Design Quality Assurance Planning and Processes	17
1.5	Design Quality Assurance Improvement.....	24
1.6	Design QA Training.....	26

Appendix A - Design Quality Assurance Procedures (DQAPR)

DQAPR- 01 Design Quality Assurance Review Procedure

Appendix B

DQAMC	Design Quality Assurance Manager Certification
DR	Design Review Comments
DUS	Design Unit Schedule
NC-D	Design Nonconformance Report
MURKK2b	Project Diary



1.0 Quality Management

This Design Quality Assurance Plan (DQAP) applies to the design activities of the TZHRC Design-Build Project (Project). It defines the following specifically for design quality control:

1. Design Quality Assurance Policy and Goal
2. Design Quality Assurance Objectives
3. Design Quality Assurance Organization / Personnel
4. Design Quality Assurance Planning and Processes
5. Design Quality Assurance Program (QA Processes and Procedures)
6. Internal Design Quality Assurance (QA)
7. Design Quality Assurance Improvement
8. Design QA Training.

A separate Construction Quality Management Plan (CQMP) will be developed for the construction and independent quality assurance activities. An overall Quality Plan (QP) will define the scope of the entire Quality Management System including its component plans.

TZC LLC has retained the services Greenman-Pedersen, Inc. to be the independent Quality Assurance Engineering firm that will among other things provide a Design Quality Assurance Manager (DQAM) and the necessary support staff. The DQAM will perform the independent quality assurance reviews of the design quality control processes described in this DQCP as required by DB sections 111 and 113.



1.1 Design Quality Assurance Policy and Goal

The Tappan Zee Constructors (Design-Builder) team is committed to quality at all levels of the Design-Build (D-B) team. The Design-Builder's executive management has provided a definition and endorsement of its Quality Policy in the Project Quality Plan, including objectives for quality and its commitment to quality. The statement explains the Design-Builder's commitment to quality and the responsibility the Design-Builder has for assuring that it meets the quality requirements of the contract. The Design-Builder's commitment to quality, and the organization's quality objectives, are posted in the TZHRC Project office.

Responsibility for and commitment to the Design Quality Assurance Policy starts at the highest level of management shown in Figure 1.1-1, and extends to Project employees and subconsultants at all levels. This DQAP describes the Design Quality Assurance Organization, and identifies the overall requirements, guidelines, and responsibility for developing and implementing Design Quality Assurance (QA) processes associated with the preparation of the design documents. Greenman- Pedersen, Inc. (GPI) is the independent Quality Assurance Engineering firm (QAEF) that will among other things provide a Design Quality Assurance Manager (DQAM). The DQAM will perform the independent quality assurance reviews of the design quality control processes described in this DQM as required by DB sections 111 and 113.

The Design Quality Assurance Manager (DQAM) provides independent QA over the design process and certifies QC procedures have been followed in accordance with the Contract. This includes the performance of documented reviews to verify that the DQCP is being followed. The Design Quality Assurance Manager (DQAM) is responsible for preparing the DQAP with associated design quality assurance processes and procedures and for training the design quality assurance team in the quality assurance procedures. This training will include a formal indoctrination of the design quality assurance policy.

In support of the Design-Builder's Quality Policy, the following is a statement of the Design Quality Assurance Team's Quality Policy:

“The Design Quality Assurance Team’s technical activities will comply with the requirements established in the TZC LLC Quality System Manual. Design Quality Assurance management will commit the resources necessary to make sure the requirements established in the TZC LLC Quality Management System Manual are understood, accepted, and fully implemented by the TZC LLC Team.”

This DQAP will apply to the Design Quality Assurance Team from the QAEF on the Tappan Zee Constructors team. The DQA Team involved in DQA Activities will be trained in the DQA processes and procedures. Use of this DQAP by all Team members will provide for uniformity of the QA processes and facilitate reviews of the QC documentation. Although certain QA tasks may be assigned to subconsultants, overall design QA and accountability will remain with the DQAM. Design quality non-conformances will be documented and resolved prior to continuing the performance of the work activity. The Design QA procedures are provided in the Appendices. Forms shown in the appendices are examples. The actual forms used may vary from these examples.

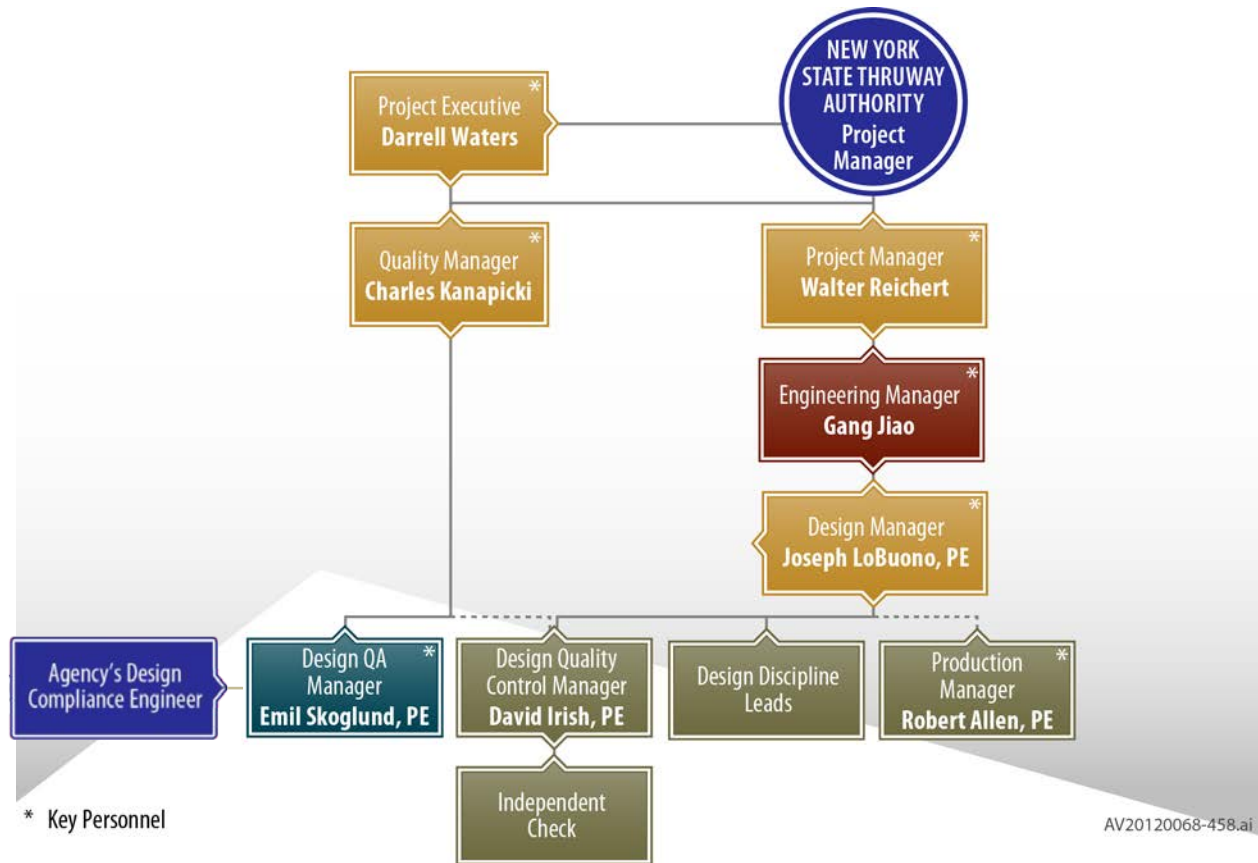


Figure 1.1-1. Design Quality Management Organization

In addition, integrating the benefits of continuous improvements into our basic operating principles - and by extension our operating practices – is an important concept of the QMS. The DQAP also promotes prevention and a proactive approach, and focuses on documenting and continuous improvement of the delivery processes.

“The goal of the DQAP is to define the actions that will be taken by the Quality Assurance Firm to ensure that the agreed upon Quality Control practices are being followed so that deliverables meet the project requirements.”

1.1.1 DQAEF Review of Design Packages

Prior to the submittal of a package, the Design Team will review the design package to verify that the contract requirements applicable to the completion level of the submittal are included. The Design Team understands that for verification purposes, the DQAEF will also perform a review of the design packages against the Contract Requirements. The DQAEF’s review of the submittal package will be focused on verifying that the Design Team has followed the approved DQCP. The QA review process and procedure are described in detail in Appendix A – Design Quality Assurance Procedures.

These efforts will not relieve the Design Team of responsibility for checking all Work and ensuring it is in accordance with contract requirements. Additional detail is provided in Section 1.4.1 Design Review Meetings.



1.1.2 Updating the Design Quality Assurance Plan

As work progresses, the DQAP will be updated to reflect current conditions. Either the D-B or the Authority's Project Manager may identify the need for revisions that will be submitted to the Authority for review. The DQAP will be submitted to the Authority for review within 30 days after the DQAM identifying the need of a formal revision. The DQAP will be submitted to the Authority for review annually (within 12 months of NTP or receipt of last Approval from the Authority's Project Manager) even if no revisions have occurred during that 12-month period. To facilitate review by the Authority, the conformed copy of the revisions will be submitted in track changes so that the revisions can be easily identified.

The DQAM along with the DQCM will develop and maintain the Design Quality Control, Design Quality Assurance, and Design Quality Improvement procedures. The DQAP and each procedure within it will be identified by a revision number. During the course of the Project, changes to these procedures and processes may be identified by the Project team. When this occurs, the DQAM will draft changes to the DQAP and discuss the changes with the DQCM and then will seek approval from the Authority. Upon informal acceptance of the change, the DQAM will distribute the process improvement via a "Preventive Action" e-mail to the Design Discipline Leads. At this point, the revised procedure will be used by the design team. Preventive Action e-mails will be stored in ProjectWise at the following link: [16.04 Preventive Action](#).

pw:\pwtzhrc:TZ_HRC\Documents\Tappan_Zee_Bridge\16.00_Design Quality Control Plan\16.04_Preventive Action\

1.1.3 Coordination with Other Documents

This DQAP will be coordinated with the Quality Plan and other Management Plan documents. The DQAM will interface with the owners of these plans through the Quality Manager. The goal is to achieve consistent terminology, integrated processes, and efficiency by reducing "gaps and overlaps" between documents.

1.1.4 Responsible Engineers and Responsible Architects

The Design Manager is responsible for developing and maintaining a list of the Responsible Engineers and Responsible Architects on the Design Team for each Design Unit. Once the list is approved by NYSTA, the DM will provide that list to the DQAM for his records, and will notify the DQAM of all approved changes. It is expected that the designer's Quality Control reviews will include verification that all members of the design team have received QC training and that all Responsible Engineers and Responsible Architects have been approved by NYSTA and are included on the current list.

1.1.5 Design Firm Roles and Relationships

The roles of the various design firms and their relationships with each other and other stakeholders are shown in the Project organization chart. All design activities are subject to the DQAP requirements.



1.2 Design Quality Assurance Objectives

The QAEF is committed to delivering a quality project. This commitment is reflected in the Design Quality Assurance Objectives. The Design Quality Assurance Objectives established by the DQAM are shown below:

1. The QAEF will ensure that the deliverables meet the project requirements by reviewing their conformance with the requirements of the Quality Management System. (See DAPR -1)
2. The QAEF will assure the compliance and effectiveness of the Quality Management System by performing periodic audits of the system on a quarterly basis and recommending improvements based on these reviews.
3. All personnel involved in the QMS process will be effective in their job by training and/or experience. A record of individual certifications and training will reside in the Project database (ProjectWise).

1.3 Design Quality Assurance Organization / Personnel

The Design-Builders' executive management shall have overall responsibility for success of the QMP and shall ensure that responsibilities and authority are defined and communicated within their organization. The DQAM shall be responsible for all Design Quality Assurance activities excluding the management of QC activities and internal audits performed by the DQCM (both DCPR-13).

The D-B's Design Manager is responsible for the general roles, interfaces, and responsibilities for design quality. The DM shall ensure the Design Discipline Leads and supporting staff adhere to the Quality Control processes and procedures in compliance with the DQCP. The DM will follow the detailed Design Control Procedures (DCPR) outlined and described in this DQCP, to control, document, verify and validate the deliverables. Design control includes verifying that the design requirements are understood and incorporated by production staff, planning the design interfaces and design verification activities, executing design verification and Quality Control Activities, and controlling design changes throughout development of the design documents. In support of the QMS, the DM will also ensure that interdisciplinary coordination is occurring and participate in the QC/QA process when required;

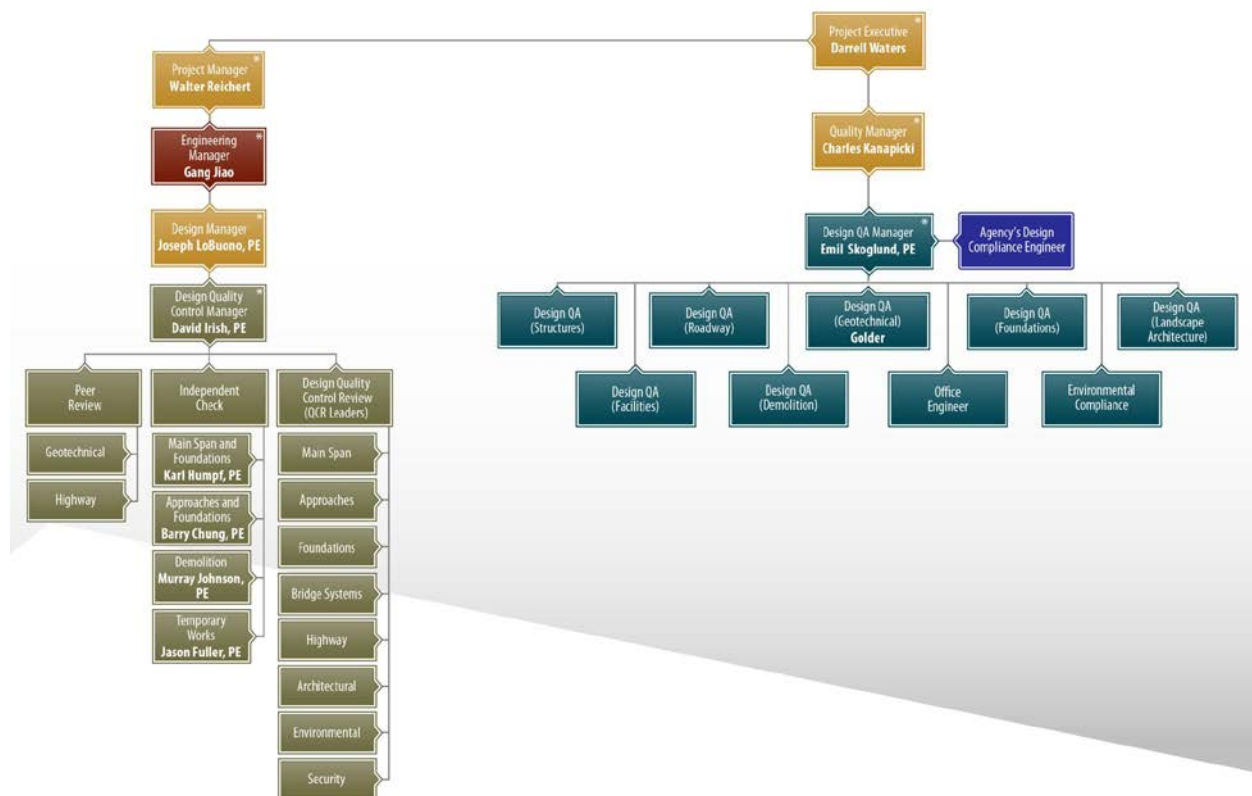
When design packages are completed, the DM will sign a certification form verifying the submittal meets the quality standards as specified in the contract

The D-B's Quality Manager is responsible for overseeing the Quality Plan, which includes the DQAP, and the preparation, implementation and update of the Quality Plan for the D-B. The DQAM will coordinate with the QM and DQCM to ensure the DQAP, and revisions, are consistent with the Quality Plan and the DQCP, respectively..

The DQAM shall be responsible for all Design Quality Assurance Activities will report to the QM and support him in meeting the Authority requirements. The DQAP, including the DAPRs in Appendix A, have been developed to document procedures, instructions, and process controls to ensure the Work being produced by the design team meets the requirements of the Contract Documents. The DQAM will review and approve, by signing the cover page, the DQAP prior to submittal to Authority. The DQAM shall be

responsible for assuring, certifying, and providing documented evidence that the Work intended to be issued as Readiness for Construction meets the requirements of the DQCP.

GPI, as the independent QAEF, will provide the resources necessary to achieve the Quality Assurance objectives. The exact size and structure of the QA staff will be based on the technical needs of the project and the schedule demands. In general, it is expected that the design QA staff will be organized as follows:



1.3.1 Responsibility and Authority

Figure 1.1-1 illustrates the design team organizational chart that demonstrates a commitment to an effective quality program to ensure design Work meets the requirements of the Contract Documents. Since quality is the responsibility of each person assigned to the Project, the organization chart graphically depicts the principal quality participants, showing lines of responsibility, authority, communication, and interfaces with the Authority.

Because each design team member has a responsibility for quality, the QA team will have the responsibility to:

- Initiate action to prevent the occurrence of Nonconforming Work.
- Assist the DQAM during the corrective action process to identify, evaluate, and document possible root cause(s).
- Recommend or initiate quality process improvements through established organizational channels.
- Assist the DQAM with the implementation of quality process improvements.



The DQAM will have the primary responsibility to identify and record possible problems relating to the design quality assurance processes.

Whenever a person or position is referred to in this DQAP, it is understood that this person or position may delegate assigned tasks as appropriate.

1.3.2 Design Quality Assurance Manager

As shown in the organization chart, the Design QA Manager, is an employee of the Independent QA Engineering Firm, he and his staff shall have no responsibilities in the production of the design Work, and shall report to the Design-Builder's Quality Manager. The Agencies' Design Compliance Engineer (DCE) shall have direct access to the Design QA Manager. The Design QA Manager is responsible for developing and maintaining a Design Quality Assurance System to achieve compliance with the Quality Assurance Goals.

The Design QA Manager shall be responsible for the QA of all Work conducted by the Designer. The Design QA Manager shall be located in accordance with the Project Requirements throughout the design process and shall be present as necessary or appropriate thereafter to manage design QA related to design support during construction, design changes, and completion of As-Built Plans.

The Design QA Manager shall assess and evaluate the Design-Builder's design QC activities in order to be able to certify to the Design-Builder and to the Agencies' that the design QC activities comply with the Quality Plan and Contract Documents. TZC LLC shall ensure that the Design QA Manager carries out all duties expressed or implied in the contract.

The Design QA Manager shall have QA responsibilities related to the following:

- Design of permanent and major temporary components;
- Changes in design of permanent components and major temporary components;
- As-Built Plans

The Design QA Manager shall also perform the following activities:

- Identify and report non-conformances/non-compliance
- Track, monitor, and report on status of outstanding design-related non-conformance reports;
- Supply monthly report (D-B 111-16.31);
- Supply a Final Design Report for each Design Unit
- Submit specified certificates (permanent components and major temporary components)
- Provide adequate resources and trained personnel for Quality Assurance activities.
- Ensure the adequacy and enforcement of design quality procedures and processes.
- Ensure that design quality control records are properly prepared, completed, maintained, and delivered to Authority, as required by the Contract Documents, to provide evidence of Quality Control and Quality Assurance Activities performed and quality results achieved.
- Coordinate with the Authorities' Design Compliance Engineer
- Through the use of the design schedule, confirm that reviewers are assigned for each discipline and Design Unit and that QA Activities are properly scheduled.
- Work with the QM and DQCM as needed to respond to audit findings, corrective action requests, Management Review action items, and other design-related issues.



1.3.3 Design Quality Control Manager

Quality Control is the responsibility of the design team and is discussed in detail in the DQCP. It is expected that the DQAM will work closely with the DQCM to accomplish the overall quality objectives of the project. The roles and responsibilities of the DQAM are described above. To further clarify the DQAM's role and more clearly delineate the responsibilities of the QAEEF, the DQCM's responsibilities are described below.

As shown in the organization chart, the DQCM will report to the DM and be independent of the Design Team's technical disciplines. The DQCM is responsible for implementing the DQCP to achieve compliance with the Design Quality Goals and train the design personnel in the Design Control Procedures (DCPRs). The DQCM is responsible for scheduling the necessary QC Activities for each deliverable to ensure that all design QC Activities are in substantial compliance with the DQCP. The DQCM shall ensure that the Design Discipline Leads have assigned the necessary Checkers and Reviewers for each Design Unit. The DQCM, and staff, will have no responsibilities for or involvement in the production of the work. The DQCM will also facilitate, monitor, and verify subconsultant compliance with the DQCP.

The Design Quality Control Manager shall also have the following responsibilities:

- Facilitate compliance of Work with the requirements of the Contract Documents and the Approved DQCP.
- Provide adequate resources and trained personnel for Quality Control Activities.
- Ensure the adequacy and enforcement of design quality control procedures and processes.
- Establish and implement procedures to control and ensure the Work performed by design subconsultants meet the requirements of the Contract Documents.
- Ensure the DQCP is being implemented and report in writing to the DM and DQAM in support of the Management Reviews and other reporting requirements.
- Ensure that quality records are properly prepared, completed, maintained, and delivered to the DQAM, as required by the Contract Documents, to provide evidence of Quality Control Activities performed.
- Through the use of the design schedule, confirm that checkers and reviewers are assigned for each discipline and Design Unit and that QC Activities are properly scheduled.
- Work with the QM and DQAM as needed to respond to audit findings, corrective action requests, Management Review action items, and other design-related issues.

1.3.4 Commissioning or Servicing

Commissioning is a systematic quality assurance process to ensure that all highway, bridge and building systems, including mechanical, electrical, plumbing and HVAC systems, are properly integrated and perform according to the design intent and Contract requirements.

Servicing deals with the services rendered to the Authority during the warranty period

TZC LLC shall establish and maintain documented procedures for ensuring and reporting that the commissioning actions meet the specified requirements.

TZC LLC shall use and modify the following industry guidelines for its commissioning process:



- A. GSA- General Services Administration Commissioning Guidelines
- B. ACG- Associated Commissioning Group Guidelines
- C. BCx-Building Commissioning Guidelines

While these industry guidelines are geared to building systems, the Project will have mechanical, electrical and plumbing systems associated with the Crossing and highway as well with the building design and construction. TZC LLC, in its Quality plan, shall modify these industry guidelines to be applicable to and cover all types of facilities in the Project.

1.3.5 Commissioning Engineer

The Commissioning Engineer shall be a Professional Engineer in the State of New York with commissioning experience and be a member of the QA Engineering Firm. He will start work at the beginning of design phase and will plan and coordinate commissioning during design and through construction. The commissioning engineer shall incorporate quality assurance and inspection activities as design and construction progresses, including design reviews, start-up, system demonstration, performance verification, fine tuning and operator training. The Commissioning Engineer can also have another assigned duty.



1.4 Design Quality Assurance Planning and Processes

The DQAM has established the following methods in order to meet the requirements of the Contract Documents and meet the goal of the DQAP, which is to define the actions that will be taken by the Quality Assurance Firm to ensure that the agreed upon Quality Control practices are being followed. The Plan promotes prevention and a proactive approach, and focuses on documenting and continuous improvement of the design delivery processes.

The Project Management Plan will establish and document the method of scheduling, monitoring, and reporting on the status of the design deliverables.

1.4.1 Design Reviews

The Design QA Firm will conduct reviews of the Design at the following stages. (See the attached Procedure for Design Quality Assurance Review, DQAPR-01 for more detail).

1. Concept Plans
2. Definitive Plans
3. Interim Plans
4. Final Plans
5. Readiness for Construction
6. Working Drawings
7. As-Builts
8. Design Changes Before Construction

1.4.2 Design Review Meetings

The DQAM shall hold design review meetings at stages (Concept, Definitive, Interim, Final, and Readiness for Construction) of the design development process, in the Project office, or otherwise agreed to by the Authority, and invite the Authority to attend, including the Design Compliance Engineer. The Responsible Engineer or Responsible Architect shall be present in the Project area for, and shall attend all Design Reviews for assigned Design Unit(s). The design review meetings shall be scheduled, conducted, and documented by the DQAM. The meetings minutes shall be taken by the DQAM and submitted to Authority within 5 Working Days after each meeting. Design Reviews will be conducted for each Design Unit and for 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.

The Authority will forward, through the DQAM, Agencies and Stakeholder comments (if any) from Design Reviews recorded on Form DR, or in a similar format approved by the Agencies to the Design Team. When received, the Design Team shall respond to review comments using the same form. If the Design Team agrees with the comment, the Design Team will respond with the Initial Disposition and provide a response describing how the comment will be incorporated in the design. If the Design Team



disagrees with the reviewer's comment, the Design Team's response will provide the basis of the disagreement.

1.4.3 Design Certifications

The Designer's organization shall check all design documents (drawings, plans, specifications, calculations, and reports) produced by the TZC organization. The Design QA Manager shall certify that these documents have been checked per Contract requirements and the TZC Quality Plan prior to Design-Reviews. The Design QA Manager shall provide the written certification specified in DB 111-11.

1.4.4 Design Quality Records

The Design QA Manager shall prepare and submit monitoring reports to the Agencies of all design issues and review comments resulting from the scheduled and additional checks and reviews, including over the shoulder reviews.

TZC LLC shall also maintain an auditable record of all Quality Plan Procedures.

TZC LLC shall submit reports of checks and reviews within seven days of the completion of the review.

TZC LLC shall develop, implement, and maintain a log of design Nonconformance Reports and/or notices indicating dates issued, reasons, status, or resolutions and date of resolution.

TZC LLC shall prepare and maintain weekly records of design activities using form MURK 2b or other forms acceptable to the Agencies. These records will include narrative description of all significant QC and QA activities taking place within the given timeframe, to include at least significant planning meetings, design units stated of finished, and reviews conducted.

1.4.5 Periodic Quality Audits

The Independent Design QA Firm shall establish and maintain documented procedures for planning and implementing periodic audits to verify whether quality activities and related results comply with planned arrangements and to determine the effectiveness of the Quality Assurance and Quality Control Plans.

Responsibility

- The DQAM is responsible for scheduling and performing internal quality audits and, if necessary, ensuring there are a sufficient number of trained auditors to meet the audit program requirements;
- The responsible Design Firm manager of each function being audited is responsible for investigating, planning and implementing any corrective action agreed upon as a result of an audit;

Planning and Scheduling

A yearly Periodic Internal Audit Schedule shall be prepared by the DQAM. The Quality Assurance Audit Schedule identifies the planned surveillance and audit activities for each procedure and also provides a status of completed audit findings. The schedule is reviewed monthly by the DQAM for update and is issued by the DQAM with the monthly Quality Assurance Activity Report.

In developing the schedule the following factors shall be considered:

- As a minimum, a QA audit shall be performed on a quarterly basis.
- Use of Survey, Geotechnical and other significant subconsultants— As a minimum, each sub-consultant in this category shall be audited once a year.



The Design QA Firm will perform Quality Audits on the following Design Quality Control Plan Procedures

1. DCPR-01 Design Quality Records
2. DCPR-02 Checking Reports and Studies
3. DCPR-03 Checking Calculations
4. DCPR-04 Independent Analytical Check (IAC)
5. DCPR-05 Checking Drawings
6. DCPR-06 Checking Input to Computer Programs
7. DCPR-07 Checking Specifications and Special Provisions
8. DCPR-08 Checking Spreadsheets
9. DCPR-09 Revisions to Readiness For Construction Documents
10. DCPR-10 Computer Software
11. DCPR-11 Constructability Review (CR) and Interdisciplinary Review (IDR)
12. DCPR-12 Quality Control Review (QCR)
13. DCPR-13 Internal Design Quality Assurance Audits
14. DCPR-14 As-Built Drawings

1.4.6 Internal Design QA Firm Procedure Audits

The Design QA Firm will perform Internal Audits on the Processes and Procedures in its ISO 9001-2008 Certified Quality Plan.

1.4.7 Design QA Manager Monthly Reports

1.4.4.1 Design QA Manager Monthly Report to the Agencies

The Design QA Manager shall submit a monthly report directly to the Agencies by the third working day of the following month that includes the following:

- A. Summary of reviews conducted
- B. Nonconforming work and current status and/or disposition (based on design non-conformance log, DB 111-16.2);
- C. Submission(s) from Design-Builder and status



1.4.4.2 Design QA Manager Final Design Report

Upon completion of the final design for each Design Unit, including all its components, the Design QA Manager shall notify the Design-Builder, with a copy to the Agencies, of any outstanding monitoring report issues or unresolved comments.

1.4.8 Design Non-Conformance Log

TZC LLC shall develop, implement, and maintain a log of Nonconformance Reports and/or notices indicating dates issued, reasons, status, or resolution and date of resolution.

1.4.9 Authority Oversight During Design

The Agencies' oversight during Design and Design Review consists of monitoring and auditing design progress including for payment, interpreting contract requirements, and verifying design compliance with contract requirements.

The Design Team understands that the Authority's Oversight activities related to design quality will include, but are not limited to the following:

- A. Assisting in providing interpretation and answers regarding contract requirements on a regular basis, often on a daily basis (such involvement is often termed over-the shoulder review)
- B. Providing input and participation in the review process as agreed during the design workshop;
- C. Participation in Design Reviews, excluding detailed checks of plans and calculations except in unusual cases;
- D. Verifying through monitoring and auditing of QC and QA records that the Design-Builder's Design Quality Manager is fulfilling his/her responsibilities and that the Quality Systems contained in the Quality Plan are being followed. An audit may include detailed checks of plans and calculations in some cases;
- E. The Agencies' Design Compliance Engineer (DCE) shall have direct access to the Design QA Manager

The Agencies' have specified roles in project monitoring, auditing and verification referred to generally as project Oversight. Their role is described in more detail in the Design Build Contract Request for Proposal (RFP) in: Part 2-DB 11, DB 112 and DB 113 and in Pat 3, Section 2- Project Management.

At the request of the Agencies or the Design-Builder, over-the-shoulder reviews may be scheduled to keep all parties informed of the status, quality, and consistency of design efforts. Over-the-shoulder reviews are intended to be interactive and to reduce the likelihood of surprises or miscommunications in the design process. Decisions made in over-the-shoulder reviews will be documented in meeting minutes that are distributed to the participants.

1.4.10 Readiness for Construction Documents

Subsequent to the Readiness for Review Meeting for an applicable design package, and incorporation of agreed to comments, the Design Team will issue Readiness for Construction documents. These documents will be signed and sealed by the applicable Responsible Engineer or Responsible Architect and identified as revision "0" in the revision block. The DQAM is responsible for the Review Meeting and for certifying that the Readiness for Construction documents meet the requirements of the DQCP.



1.4.11 Revisions to Readiness for Construction Documents (after DQAM Certification)

Changes to a design document after the detailed check, design assessment, certification by the DQAM and Issued as Readiness for Construction will be treated as a new design. The revised design document will be Checked and/or Reviewed, as described on the Design Development and QC Process Documentation Form for the proposed change, commensurate with the degree and nature of the change. Changes to design documents that have been Issued as Readiness for Construction will be identified, documented, reviewed and approved by authorized personnel before their implementation, with full consideration for impacts to ongoing or completed Work as described in DCPR-09 Revisions to Readiness for Construction Documents. Changes may be initiated by the Agencies' request, Design Team or Contractor. Any proposed changes shall be reviewed and approved by the Responsible Engineer or Responsible Architect who produced the original work if available; otherwise, approval will be provided by the alternate Responsible Engineer or Responsible Architect. Changes shall be responsive to the design input and shall be verified for consistency with relevant previously accepted designs. The Notice of Design Change form will be used to inform the Contractor and to document Contractor approval of proposed design changes.

Changes to previously issued Readiness for Construction (RFC) documents will be in a format that can enable changes to be readily apparent and traceable. The procedure for identifying revisions to RFC documents is described in DCPR-09 Revisions to Readiness For Construction Documents. For drawings, revisions will be identified in the revision block and the current revision identified by a revision cloud and revision triangle. Previous revision clouds and revision triangles will be removed if the drawing is subsequently revised.

Revisions to previously RFC MS-Word documents will be identified using the "track changes" function. Additions to the document will be underlined and deletions will be in "revision balloons" in the right-hand margin or struck from the text. A clean copy of the text document and a copy showing the edits will be provided. The version of a text document will be identified in a revision block on the cover of the document, i.e. reports and studies, or in the footer, i.e. specifications.

1.4.12 Working Drawings

TZC LLC shall develop Working Plans. TZC LLC shall check review , and certify Working Plans in accordance with DB 111-11.1 through 111- 11.4 and DB 11-12 prior to issuing such plans to construction. QA will perform its review and certification of the QC processes.

TAC LLC shall invite the Agencies to participate in reviews of Working Plans.

1.4.13 As –Built Review

TZC LLC shall submit As-Built Plans complete for each Design Unit to the Agencies for review and Design Acceptance in accordance with DB 111.10. The Agencies' review and Design Acceptance will be one of the processes used by the agencies to satisfy themselves that the project has been designed and constructed in accordance with Contract requirements and that the As-Built Plans comply with Contract Documents. QA will perform its review and certification of the QC processes.

1.4.14 Contract Commitments

The design team will deliver Form DUS to identify Project Design Unit deliverables and their timing. The DQAM will use this to plan for Quality Assurance personnel.



1.4.15 Quality Records

The DQAP, and Design Quality Assurance Records will be maintained in separate and uniquely named folders in ProjectWise. A hard copy of Quality Control Records may also be stored in document control (storage area). Upon formal request of the DQAM, the Quality Records will be made available to the Authority auditor to facilitate confirmation that appropriate Design Control Procedure(s) have been followed. Hard copies of the Quality Records may not be removed from the document control (storage area) during DQAM or Authority audits. If required, a separate folder will be created in ProjectWise where electronic copies of Quality Records can be copied to facilitate DQAM or Authority audits.

Electronic quality records will be stored in a shared accessible system such as ProjectWise. Hard copy quality records that are generated in remote offices away from the project office will be organized and stored according to the same systems and procedures used in the project office. Copies of these files must be provided to the project office for storage in the central project office filing system according to the Document Control Plan.

1.4.16 DQAP Approval and Distribution

The DQAM will develop the DQAP with input from the DQCM, Design Manager, Design Discipline Leads, and CADD Manager. The current draft and approved copies of the DQAP will reside in ProjectWise. The approved DQAP will be stored in ProjectWise as both a locked Word document and pdf file. Approved changes since the previous version will be shown in track changes format in the locked Word document to facilitate identification of the changes. The file name will identify the latest approved document. Superseded documents will be moved to a “Superseded” documents folder.

Once approved, the DQAP will be distributed to the QA team and will be the basis of the QA training.

1.4.17 Subconsultant Selection, Control of Quality and Submittals

The QA Team was formed during the qualifications phase of the Project. This section is intended to discuss the process for adding subconsultants, if any, to the QA Team since the notice of award. Subconsultants are generally added to a QA team based on historical performance of intended services. This includes both technical capabilities and adherence to the QA processes and procedures. A meeting with the proposed subconsultant may occur to discuss the Project requirements and qualifications of the subconsultant prior to selection. A project principal selects the subconsultant based on the meeting, any qualifications provided, input from other member of the project team and/or judgment. As discussed in Section 1.8, all subconsultants are required to use the Project DQAP and staff assigned to perform design QA Activities will be trained in the QA process and procedures.

The subconsultant is responsible for the quality of QA records they produce for this Project. Verification of quality may occur through several means including:

- Informal coordination with other QA Team members;
- Review of QA Documentation by the DQAM;
- Periodic audits conducted by the DQAM.

Documents generated during the Review of QA Documentation and Periodic Audits will be retained as Quality Records.



1.4.18 Design Quality Assurance Procedures

The procedures described in Appendix A, and listed below, identify the overall process, guidelines, requirements, and documentation for each Quality Assurance Procedure to be followed by the QAEF.

DQAPR-01 Quality Assurance Scheduled Review Audits (Review of QC Documentation)

DQAPR-02 Quality Assurance Periodic Audits

Additional forms that are required throughout the QA process are included in Appendix B.

1.4.19 Control of Documents and Data

Design QA records shall be stored in Project Wise. Hard copies of the pdf files of design documents, design QA records, and the DQAP will be stored in Document Control.

1.4.19.1 Document and Data Approval and Issue

The DQAP will be version controlled to and signed by the DQAM to provide for proper authorization. The DQAM will distribute updates to the QA Team. Outdated and/or obsolete versions of the DQAP will be moved to a suspended folder. The current version of the DQAP will reside in ProjectWise with both track changes from the previous version shown and as a clean document.



1.5 Design Quality Assurance Improvement

The DQAM will be responsible to establish, document, and implement a program for quality improvement. The DQAM will use corrective and preventive actions to facilitate, in part, continuous improvement. Feedback from the design team, Design-Builder or management will be used to identify opportunities for improvement. When opportunities for improvement are identified, formal and informal meetings may be used to communicate such opportunities. When preventive action e-mails are used, these e-mails will be retained in ProjectWise. If changes to the DQAP are required, the DQAM will initiate the changes, seek informal acceptance of the change by the Authority, and communicate the change to the design team for implementation.

The DQM shall establish and maintain documented procedures for planning and implementing periodic audits to measure the effectiveness of the DQAP and identify quality improvement opportunities (DAPR-3). The DQAM shall schedule and perform internal design quality audits on the basis of the status and importance of the activity to be audited as well as the Authorities auditing efforts and the goals of the Project. Personnel who are assigned to audit activities shall not have direct quality responsibilities for the respective activities they audit. The results of the audits shall be recorded and reviewed with the personnel having responsibility in the area audited not later than 3 Working Days following completion of the audit.

The DQAM or project management personnel shall implement the necessary corrective actions to improve any deficiencies found during the audit. The DQAM's follow-up activities shall ensure the implementation and effectiveness of the corrective action taken. Corrective actions shall identify the root causes of deficiencies and shall be developed, implemented, and tracked to prevent the recurrence of future deficiencies. Corrective actions shall be monitored through review of documents, surveillance, or follow-up audits. Records of corrective actions shall be kept together with the respective audit records and submitted to the Authority upon request.

1.5.1 Corrective and Preventive Actions

The DQAM will use the Quality Audit Finding Form (Form DCPR-3B) to address findings requiring corrective action. When required, the DQAM will investigate the root cause of the nonconformance and take step to correct the deficiency, i.e. additional targeted training. The corrective action will include follow-up to verify the steps taken have resulted in the desired outcome. The need for corrective action may be identified by the DQAM or management staff.

The DQAM, or other management staff, may identify potential QC process nonconformances or opportunities for improvement. When this occurs, the DQAM will determine a course of action and will distribute the process clarification via a "Preventive Action" e-mail to the Design Discipline Leads. Preventive Action e-mails will be stored in ProjectWise.

1.5.2 Management Review of the Quality Management System

The Design Manage, DQCM and DQAM will participate in the Design-Builder's executive Management Reviews of the QMS at planned intervals, not to exceed 3 months, to ensure its continued suitability, adequacy and effectiveness in satisfying the D-B's quality policy's and objectives.



1.5.3 Management Review Input

The input to the review related to the design shall include, as appropriate:

- Internal audit findings;
- Agencies' feedback;
- Process performance;
- Status of Corrective and Preventive Actions;
- Follow-up items from previous management reviews
- DQCP and DQAP updates; and,
- Recommendations for improvements.

1.5.4 Management Review Output

Results of the Management Reviews related to the design shall include, as appropriate, decisions and directives relative to recommendations for further actions associated with changes to QC and internal QA processes, materials and resources. Records of the reviews, including meeting minutes, shall be maintained in ProjectWise at the following link: [16.12 Management Reviews](#).



1.6 Design QA Training

1.6.1 QA Training

The DQAM will develop and deliver QA training for use by personnel involved in design QA Activities. The training will focus on improving the competency and skill required to perform design QA Activities. The training document will be maintained in ProjectWise and be available to all design personnel. Training will be documented through attendance forms and the attendance forms will be stored in ProjectWise. The date the training was conducted will be entered into a data base of all QATeam personnel so that the DQAM can identify personnel who require QA training. The DQAM will periodically review the database to identify personnel involved in QA Activities who have not received QA training. The DQAM will conduct the QA training prior to the personnel performing the QA Activities.

When required, revisions to the training document will be shown in track changes so that the clarifications and process improvements, for example, can be easily identified. The updated version of the training document will be sent to the Design Discipline Leads for further distribution. Updates of the QA processes in the DQAP will be communicated to the design team through the Preventive Action process, a link to the revised document or through additional training if determined to be necessary by the DQAM.

1.6.2 Comment Resolution Guidance

The DQAM will provide guidance to design staff that may interface with the Authority's oversight efforts (design reviews and audit process) to ensure they understand their roles and responsibilities for cooperating and responding to these design reviews and audits.



APPENDIX A

Design Quality Assurance Procedures (DAPR)

DQAPR-01

Design Quality Assurance Review



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1.0 PURPOSE - To establish the requirements for Design Quality Assurance Reviews, including the verification that the Quality Control activities and related results comply with the requirements of the Design Quality Control Plan (DQCP). Results of these Design QA Reviews shall be maintained as Quality Assurance Records. Based on these reviews the Design Quality Assurance Manager (DQAM) will certify to the owner that the Design QC activities comply with the DQCP.

2.0 SCOPE - This procedure is applicable to the design of all permanent or major temporary components undertaken by any member of the design-build organization, including design subconsultants and contractor performed design engineering activities ("means and methods" engineering). Quality Assurance Reviews will be performed by the Design Quality Assurance Manager and/or designee. The procedure also provides for coordination and follow-up of Quality Assurance Review findings and recommended corrective actions.

3.0 RESPONSIBILITIES

Design Quality Assurance Manager - schedules and leads Quality Assurance Reviews to ascertain that the overall QC Program is adequate, objective, and effectively implemented.

Design Manager and Design Discipline Leaders - responsible for providing a receptive and cooperative response to the Quality Assurance Reviewer(s) by personnel in their group; and, providing timely access, during the performance of the Quality Assurance Review, to pertinent facilities and documents.

Quality Assurance Reviewer(s) - responsible for planning, scheduling, and conducting the Quality Assurance Review(s) in a professional and objective manner and, consistent with the planned Quality Assurance Review objectives, minimizing interruptions to normal workflow of the organization being Quality Assurance Reviewed. The Quality Assurance Reviewer(s) is to present evaluations and findings that are valid and supported by specific written requirements of the Quality Control Program.

All Project Design Team members - to be familiar with their quality control responsibilities and the checklist items for the Quality Assurance Review.

4.0 PROCEDURE

4.1 Quality Assurance Reviews

Quality Assurance Review activities must be planned, conducted, and documented in a manner that enables the DQAM to certify to the owner that the Design QC activities comply with the DQCP. All design deliverables will receive a QA Review before they are submitted to the owner. To facilitate that review, the Design Manager will compile and submit the following to the DQAM:

- Design Quality Assurance Review Cover Sheet (form DQAR-1)
- Signed Quality Control Review Form (DCPR-12A) with all attachments, generally expected to include:
 - Check Prints showing the check and/or review performed.
 - Track changes version of an MSWord document.
 - "Clean" set of documents reflecting the checked changes.
 - NDC form and supporting documentation such as a Request for Information form and/or sketches that describe the proposed change.

- Originator Certificate of Completion form.
- *Design Development and QC Process Documentation* form.
- Forms for CR, IDR, and/or QCR if applicable based on the requirements of the DQCP.

Upon receipt of a design package, the DQAM will assign the appropriate reviewer from the QA firm. The QA Reviewer will review the submitted documents using the Design Quality Assurance Review Checklist (Form DQAR-2).

The Quality Assurance Reviews must include, but not be limited to, checking that approved QC procedures have been followed and documented. A Quality Assurance Review checklist will be developed and used during Quality Assurance Reviews to provide objectivity and continuity of Quality Assurance Reviews. In-depth technical reviews of calculations, code compliance, dimensions, etc. is not the intent of the QA review however, the QA Reviewer may sample the contents of the design deliverable based on the size and complexity of the submittal package. Small submittals may be reviewed in their entirety. Larger packages may undergo a level of sampling based on the results of previous submittals, complexity of the QC Records, or judgment. The current submittal, or future submittals, may undergo increased sampling rates based on the outcome of the sampling. Once the DQAM has determined that the DCPRs have been implemented, the sampling rate may be decreased.

Form DQAR-2 will be used to document the Quality Assurance Review. At the completion of the Quality Assurance Review, the QA Reviewer will schedule a convenient time with the designer to discuss the results of the review, identify any Corrective Actions that are required, and establish a timeline for resolving all comments. This process will be repeated until all comments are resolved, and the DQAM can certify that the Design QC activities comply with the DQCP.


Quality Assurance Review activities, including resolution of deficiencies, are documented and retained as quality records to allow the Quality Manager to monitor the overall Quality Assurance Review program. The status of Quality Assurance Reviews and findings will be recorded in the Project data base.

Deficient areas will be re-Quality Assurance Reviewed or otherwise verified, subsequent to the completion of a corrective action, to ascertain that corrective measures have been implemented and are effective, before the Quality Assurance Review is closed.

Personnel conducting Quality Assurance Reviews must not have direct responsibility for performing the activities being Quality Assurance Reviewed.

5.0 ATTACHMENTS

Form DQAR-1	Design Quality Assurance Review Cover Sheet
Form DQAR-2	Design Quality Assurance Review Checklist
Form DQAR-3	Corrective Action Request
Form DQAR-4	Corrective Action Request Status Log
Form DQAR-5	Design Quality Assurance Review Meeting Agenda

	DQAR-1: DESIGN QUALITY ASSURANCE REVIEW COVER SHEET	
	Project: _____	Request Date: _____
	Design Package No.: _____	Design Stage: <input type="checkbox"/> Concept <input type="checkbox"/> Definitive <input type="checkbox"/> Interim <input type="checkbox"/> Final <input type="checkbox"/> Readiness for Construction <input type="checkbox"/> As Built
	Design Firm(s): _____ _____ _____	
Design QC Manager: _____	Review Deadline: _____	

Design Product: ☐ Reports: _____

☐ Calculations: _____

☐ Specifications: _____

☐ Plans: _____

☐ Other: _____

Supporting Documentation: ☐ Signed DCPR-12A
☐ Other:: _____

Signatures:	
_____ Design Quality Control Manager	_____ Date Submitted for QA Review
_____ Design Quality Assurance Reviewer	_____ Date – Review Completed, Comments Provided
_____ Design Quality Assurance Manager	_____ Date – Comment Resolution Accepted

Instructions:

1. Design QC Manager fills out QA Review form and transmits to DQAM together with documents.
2. After review, QA Reviewer returns reviewed document and completed signed QA Review form w/ comments to DQCM.
3. DQCM is responsible for reviewing comments, making appropriate changes or notations, and informing QA Reviewer of changes made.
4. DQAM signs form upon resolution of comments.
5. Original QA Review documentation maintained in Project files.



Form DQAR-2
DESIGN QUALITY ASSURANCE REVIEW CHECKLIST Page 1 of ____
TZHRC D-B PROJECT

DESIGN PACKAGE QUALITY ASSURANCE REVIEW NO.: _____

QUALITY ASSURANCE REVIEW STAGE: ☐ _____ Submission (Concept, Definitive, Interim, and Final)
☐ Post - Final Package Review (Readiness for Construction Certification Process)

QUALITY ASSURANCE REVIEWER: _____ DATE(S) OF QUALITY ASSURANCE REVIEW: _____

NAME OF FIRM QUALITY ASSURANCE REVIEWED: _____

NAME OF RESPONSIBLE PARTY (DDL, DM, Task Leader, etc.): _____

PROJECT SEGMENT/ TASK / ITEM(s) QUALITY ASSURANCE REVIEWED: _____

	QA REVIEW ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS		REMARKS
				YES	NO	
1.	Plan reviews completed? CR, IDR, QCR?	DCPR-11, DCPR-12	Review package to verify that comment sheets are attached.	_____	_____	_____
2.	Are calculation check prints available?	DCPR-03	Review originals and check prints	_____	_____	_____
	Independent Analytical Check	DCPR-04	Review Final Structure Calculations	_____	_____	_____
	Structures Load Rating	DCPR-03	Prior to RFC; Detail design check	_____	_____	_____
3.	Is checking of computer input being accomplished?	DCPR-06	Review originals and check prints	_____	_____	_____
4.	Is checking of Spreadsheet verified?	DCPR-08	Review check prints.	_____	_____	_____

DESIGN QUALITY ASSURANCE REVIEW CHECKLIST Page 2 of ____
TZHRC D-B PROJECT

	QA REVIEW ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS		REMARKS
				YES	NO	
5.	Are drawing check prints (redlines) available?	DCPR-05	Review record set and check prints.	_____	_____	_____
6.	Are check prints of specifications available?	DCPR-07	Review record set and check prints.	_____	_____	_____
7.	Are procedures for marking up check prints being followed?	DCPR-03, 05	Review check prints or redlines.	_____	_____	_____
8.	Are record prints properly signed and dated?	DCPR-03, 05	Review record set QC Stamp.	_____	_____	_____
9.	Were calculations checked prior to drawing checking?	DCPR-03	Review record sets & dates.	_____	_____	_____
10.	Are current design changes incorporated?	DCPR-09	Review Notice of Design Change Log & revision block in dwg(s).	_____	_____	_____
11.	Are Quality Review prints and/or comments available?	DCPR-11, 12	Review documentation of CR, IDR, and QCR Reviews.	_____	_____	_____
12.	Are all review comments addressed or incorporated in the final documents?	DCPR-11, 12	Review documentation of CR, IDR, and QCR Reviews.	_____	_____	_____
		DQCP 1.4.2	Review Authority Comment Logs.	_____	_____	_____
13.	Has procedure for checking Reports been followed?	DCPR-02	Review record set and check prints.	_____	_____	_____

DESIGN QUALITY ASSURANCE REVIEW CHECKLIST Page 3 of ____
TZHRC D-B PROJECT

	QA REVIEW ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS		REMARKS
				YES	NO	
14.	Have Design Checklists been prepared?	DQCP 1.5.1	Review checklists.	_____	_____	_____
15.	Third-party comments	DQCP 1.4.2	Review Comments	_____	_____	_____
16.	DM Certification	DQCP 1.5	Review Form	_____	_____	_____
17.	Other:			_____	_____	_____

ADDITIONAL COMMENTS ATTACHED []

QUALITY ASSURANCE REVIEW FINDINGS ATTACHED []

CERTIFICATIONS

This checklist is, to the best of my knowledge, a true and accurate assessment of QC activities and compliance of the Design Package submitted, by:

_____, Quality Assurance Reviewer

Date: _____

ADDITIONAL COMMENTS:



Form DQAR-3
CORRECTIVE ACTION REQUEST

QUALITY ASSURANCE REVIEWED ITEM/ DESIGN PACKAGE NO.:		QUALITY ASSURANCE REVIEW NO.:
QUALITY ASSURANCE REVIEWOR:		CHECKLIST ITEM NO.:
DATE(S) OF QUALITY ASSURANCE REVIEW:		REFERENCE:
REQUIREMENT:		
FINDING:		
FINDING ACKNOWLEDGED BY:		DATE:
ROOT CAUSE ANALYSIS:		
RECOMMENDED CORRECTIVE ACTION:		
SCHEDULED COMPLETION DATE:	CORRECTIVE ACTION RESPONSIBILITY ASSIGNED TO:	
CORRECTIVE ACTION TAKEN:		
CORRECTIVE ACTION COMPLETION DATE:		
SIGNATURE:		
CORRECTIVE ACTION VERIFIED BY:		DATE:
COMMENTS:		



Form DQAR-4

Corrective Action Request Status Log

CAR Number	Date of Issue	Design Package No.	Subject	Responsible Party	Root Cause Determined by Date	Proposed Completion Date	Date of Verification and Closure

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Form DQAR-5 Design Quality Assurance Review Meeting Agenda

TAPPAN ZEE HUDSON RIVER CROSSING PROJECT

Contract D214134

PIN 8TZ1.00

Project TA#: TANY 12-18B

Meeting Date: _____

Start Time – Estimated Completion Time: _____ to _____

Location of Meeting: _____

Meeting Leader: _____

Topic: _____

Invitees: _____

	Topic(s)	Discussion Leader
	<ol style="list-style-type: none">1. Introductions2. Package Reviewed3. Review Findings4. Corrective Actions Required5. Completion Schedule6. General Discussion	

Attachments:



APPENDIX B

DQAMC	Design Quality Assurance Manager Certification Form
DR	Design Review Comments
DUS	Design Unit Schedule
NC-D	Design Nonconformance Report
MURKK2b	Project Diary



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DRAFT



TZHRC Design-Build Project

Design Quality Assurance Manager Certification

Submittal Title:

Submittal Date:

As Design Quality Assurance Manager, I hereby certify that the design, drawings and specifications for this design deliverable have been prepared in accordance with the Design-BUILDER's Quality Plan, and that:

1. Design checks have been completed by the designer in accordance with the DQCP
2. Quality Assurance Reviews have been performed in accordance with the DQAP
3. Any deviations or design exceptions have been approved in writing by the Agencies
4. All outstanding issues or comments from previous Design Reviews have been resolved

Signed: _____

Printed Name: _____

Date: _____

Sheet _____ of _____

Dispositions: A = Will incorporate; B = Will evaluate; C = Delete comment; D = Will incorporate in next submittal
Project QA File: _____

PART 2 - DB §111A FORMS
9 March 2012

FORM DUS
Design Unit Schedule (DB Section 111-2)

Design Unit Designation/ Code	Design Unit Description	Planned Review Stages (1)	Information/Components to be Reviewed	Planned Review Dates (Month After NTP)	Percent Complete Represented by Review
		Definitive			
		Final			100%
		Definitive			
		Final			100%
		Definitive			
		Final			100%

(1) Provide information as necessary to reflect additional interim and/or readiness for construction reviews planned between Definitive Design and final Design Reviews.

FORM NC-D
DESIGN NON-CONFORMANCE REPORT
(DB Sections 111-11 and 111-16)

From (Originator): _____ Date: _____
(Name and initials of Design QA Manager or Agencies' Project Manager or Designee)

To: _____
(Names of Design-Builder's Project Manager and Responsible Engineer)

Project name/Number: _____ Design Unit ID: _____

Copy: Design Compliance Engineer and Agencies' Project Manager

Transmittal/File No. _____ Applicable Contract Requirement: _____
(Part and Section Number)

The design Work on the referenced Design Unit is not in conformance with the noted Contract requirement for the reasons stated below (Attach additional sheets as necessary):

RESOLUTION: _____ Date: _____

From: _____
(Names and initials of Design-Builder's Project Manager and Responsible Engineer)

To: Originator as noted above

Copy to: Design Compliance Engineer, Agencies' Project Manager, and Design QA Manager

The above noted design non-conformance has been corrected and/or resolved as indicated below (attach additional sheets as necessary):

The following actions have been taken to prevent occurrence of similar non-conformances (attach additional sheets as necessary):

Acknowledgement of Receipt: _____ Date: _____

(Name and initials of Agencies'
Project Manager or Designee)

Comments by PD, if any: _____ None _____ [See attached sheet(s)]

Send copy of completed, acknowledged form to Design-Builder and Agencies' Project Manager's files.

DESIGN-BUILDER'S WEEKLY DESIGN QUALITY CONTROL PROJECT DIARY

JOB STAMP

Page No. _____

Sheet No. ____ of ____ Sheets

Week ending on (date): _____

Design-Builder's Work Hrs. _____

MAJOR CONTRACT OPERATIONS

LR. No.	Design QC Staff Name	Work Assignment and Identification

Remarks:



Per agreement with NYSTA, this Revision 1 issue of the TZC, LLC Quality Plan will only address design related activities. The construction portions of this Quality Plan (see table below) are being developed and will be included in a Revision 2 issue.

**TABLE OF CONTENTS NOT INCLUDED
WITH THE
TZC, LLC QUALIT PLAN, REVISION 1**

Section	Title	Revision Date
4	Document Control	Not Included
5	Purchasing	Not Included
5.1	Subcontractor Qualification	Not Included
5.2	Field Receiving and Inspection	Not Included
5.3	Material and Equipment Storage and Maintenance	Not Included
6	Product Identification and Traceability	Not Included
7	Process Control	Not Included
8	Activity Plan for Construction	Not Included
8.1	Inspection and Testing	Not Included
9	Monitoring and Measuring Equipment	Not Included
10	Inspection and test Status	Not Included



SECTION 11 - CONTROL OF NONCONFORMANCES

Purpose

TZC, LLC Control of Nonconformances policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.1.1 Quality System Procedures, Part O and X and 113-3.11 Control of Nonconforming Product.

NOTE: This section of the manual is to establish a procedure for control of construction related nonconformances and, as such, is focused on construction quality control and quality assurance activities. For Control of Nonconformance related to design development see the Design Control section of this manual along with the DQCP and DQAP attached to that section.

This procedure and those referenced in the DQCP and DQAP apply to those generated internally as well as those issued by NYSTA. In either case the entity issuing the nonconformance reports (NCR) is the only one able to close the NCR.

SCOPE

This procedure describes the methods and responsibilities for controlling nonconforming items to prevent their inadvertent use or installation when other control methods, inspection reports, surveillance reports, etc. are considered inadequate. This procedure provides for the identification, documentation, evaluation, disposition, notification, segregation (prevention of inadvertent use/installation), and reinspection of these nonconforming items.

Significant or repetitive nonconforming conditions are to be documented on a Corrective Action Report. A significant condition is defined as operating system and/or procedural deficiencies evaluated by management (as to the magnitude of the problem and commensurate to the risks encountered) and judged to warrant a Corrective Action Report (CAR). This also includes where a trend is noted (i.e. the same nonconforming condition occurs three or more times).

GENERAL

Items Requiring an NCR

Nonconformance Reports are issued when:

- An item, document or a work process does not comply with a specified requirement.
- Construction damage has occurred to existing or turned over plant property.

Nonconformances shall be documented using the attached form.

Responsibility for Identifying Nonconformances

TZC, LLC will issue Nonconformance Reports on self-perform work, as well as subcontracted work, when applicable.



The Construction Subcontractors have the first responsibility for the identification, control, and disposition of nonconforming items within their Scope of Work. TZC, LLC will issue a Nonconformance Report when the Construction Subcontractor has not issued one. It is not necessary to have more than one Nonconformance Report active on the identical nonconforming condition.

Inspection personnel usually initiate Nonconformance Reports; however, anyone may initiate an NCR.

Control of Nonconforming Items

The Construction Manager will take measures to provide holding areas or other methods for segregating nonconforming items to prevent unauthorized use, mixing with conforming items or incorporating into future construction. Where physical segregation is not practical, tagging, marking or other positive means of identification is acceptable. The TZC, LLC Construction Quality Control Manager may elect to use "HOLD" tags/stickers (attached) for additional validation that the item is not to be used until the nonconforming conditions have been resolved.

NCR Dispositions

There are four choices for disposition of a nonconformance report.

- | | | |
|-----------|---|---|
| Use as Is | - | Permission granted by the responsible engineering group (and typically the client) to use an item that does not conform to specified requirements. This is typically a disposition that our clients will want to approve. |
| Rework | - | Action taken on a nonconforming item to make it conform to specified requirements. |
| Repair | - | Action taken on a nonconforming item to make it acceptable for use. This is typically a disposition that our clients will want to approve. |
| Replace | - | The item is rejected and replaced in kind. |

PROCEDURE

Documentation of Nonconformance

For materials and equipment identified as nonconforming (per the descriptions in the "General" section of this procedure), generate a Nonconformance Report (attached) to document the nonconforming item(s). The report is to be processed as follows:

Initiator

- Enter the date the nonconformance is documented.
- Enter either TZC, LLC, the name of the Subcontractor or Vendor to identify organization responsible for the nonconforming work.
- Use the entries in the header of the form to provide unique traceability and identification to the nonconforming item.
- Enter a complete description of the nonconforming condition.



TZC, LLC QUALITY PLAN SECTION 11 – CONTROL OF NON CONFORMANCES

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April 12, 2013
Revision: 1

- The initiator may propose a disposition, but it is not required.
- Enter the cause code of the nonconforming condition. Refer to Attachment 1 for a list of cause codes. **Note:** A full root cause analysis is not required for nonconformance reports since they are considered less severe than corrective action reports (which do require a full root cause analysis).
- The initiator provides the NCR completed as noted above to the TZC, LLC Construction Quality Control Manager and Quality Manager.

TZC, LLC Construction Quality Control Manager

NOTE: Evaluate the report to determine that the described condition is a valid nonconformance. It is not necessary to have more than one Nonconformance Report active on the identical nonconforming condition. If a Construction Subcontractor has issued the NCR, it should not be duplicated by TZC, LLC.

Assign a unique number to the report and enter the number on the report and on the "Nonconformance Report Log" (attached).

If a hold tag is needed, enter the hold tag number and have the hold tag installed on the item. The hold tag number should be the same as the NCR number. If a hold tag is not to be used, enter NA.

The TZC, LLC Construction Quality Control Manager provides a copy of the NCR completed as noted above to the appropriate TZC, LLC manager and Quality Manager.

TZC, LLC Construction Manager

Evaluate the proposed disposition, modify if necessary, or enter the disposition.

Nonconforming conditions that can not be corrected in full conformance with the applicable specification or conditions that require a modification to a design will require approval by the Project Design Engineer. In this case, check "yes" and obtain the Project Design Engineer approval. Any documentation provided by the Design Engineer that supports the disposition should be attached to the NCR original. For subcontractor NCR's, this approval is obtained through the TZC, LLC Construction Engineering Manager.

If the disposition corrects the nonconformance to full compliance with the applicable specification, check "no".

After completing the disposition instructions and obtaining the required approvals, sign and date.

Send the original NCR to the TZC, LLC Construction Quality Control Manager and send a copy to the TZC, LLC Quality Manager and Project Manager.



Project Manager

Upon receipt of the approved NCR disposition, perform the applicable construction actions specified in the NCR disposition. (Request removal of QC hold tag prior to performing work, if one has been applied.)

TZC, LLC Construction Quality Control Manager (or designee)

NOTE: The TZC, LLC Construction Quality Control Manager or TZC, LLC Subcontractors or subtier Subcontractor initiating NCR's that require Project Design Engineer approval should send a copy of the approved NCR to the TZC, LLC Construction Quality Control Manager (prior to performing the actions specified in the NCR disposition, if possible).

Sign and date once verification of satisfactory completion of the disposition has been made.

Obtain any other necessary approvals and make distribution as required for the project.

DOCUMENTATION

The TZC, LLC Construction Quality Control Manager shall retain all NCR's and the NCR log in the Quality Files.

FORMS

Nonconformance Report
Nonconformance Report Log
Hold Tag/Sticker

ATTACHMENTS

Attachment 1 - Instruction for Completion of Non-Conformance Report
Attachment 2 - Nonconformance Report Routing Chart – Manual Processing



Attachment 1 - Instruction for completion of Non-Conformance Report (NCR)

1 Description of Non-conformance:

The initiator shall describe the requirements that were not met and a detailed description of the Non-conformance.

2 Cause Code:

The underlying reason(s) for the occurrence of the reported nonconformity will be evaluated and the cause code(s) added to the form.

Cause Code	Description
C01	Client Driven
C02	Communication Driven
C03	Equipment or Material
C04	External Phenomenon
C05	Location Driven
C06	Management Driven
C07	No Procedure
C08	Procedure/Work Process not followed - select from below
C08a	Not Aware of Procedure (includes not trained)
C08b	Ignored Procedure (includes no time / low priority / not important)
C08c	Misapplied Procedure (includes not understood / thought not to apply)
C08d	Not Effective (needs update / improvement / is inappropriate) / incorrect
C08e	Incorrect Reference to Procedure (includes incorrectly specified)
C08f	Procedure Not in Native Language
C09	People Driven
C10	Systems Driven
C11	Work Environment
C99	Other

NOTE: If codes 7 or 8 are used, specify the procedure(s) affected.

3 Disposition

Use-as-is	Permission granted by the Project Design Engineer (and NYSTA for those issued by NYSTA) to use an item that does not conform to specified requirements.
Re-work	Restore to original specification, does not require Design Engineer approval.
Repair	Does not meet original specification, correct (repair) for “fit-for-use” condition. Requires approval from design engineer and may require approval of client.
Replace	Item is rejected and replaced in kind.



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SECTION 11 – CONTROL OF NON CONFORMANCES

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Add these terms to the NCR dispositions above.

Provide instructions for implementation or justification of the selected disposition.

IMPLEMENTATION

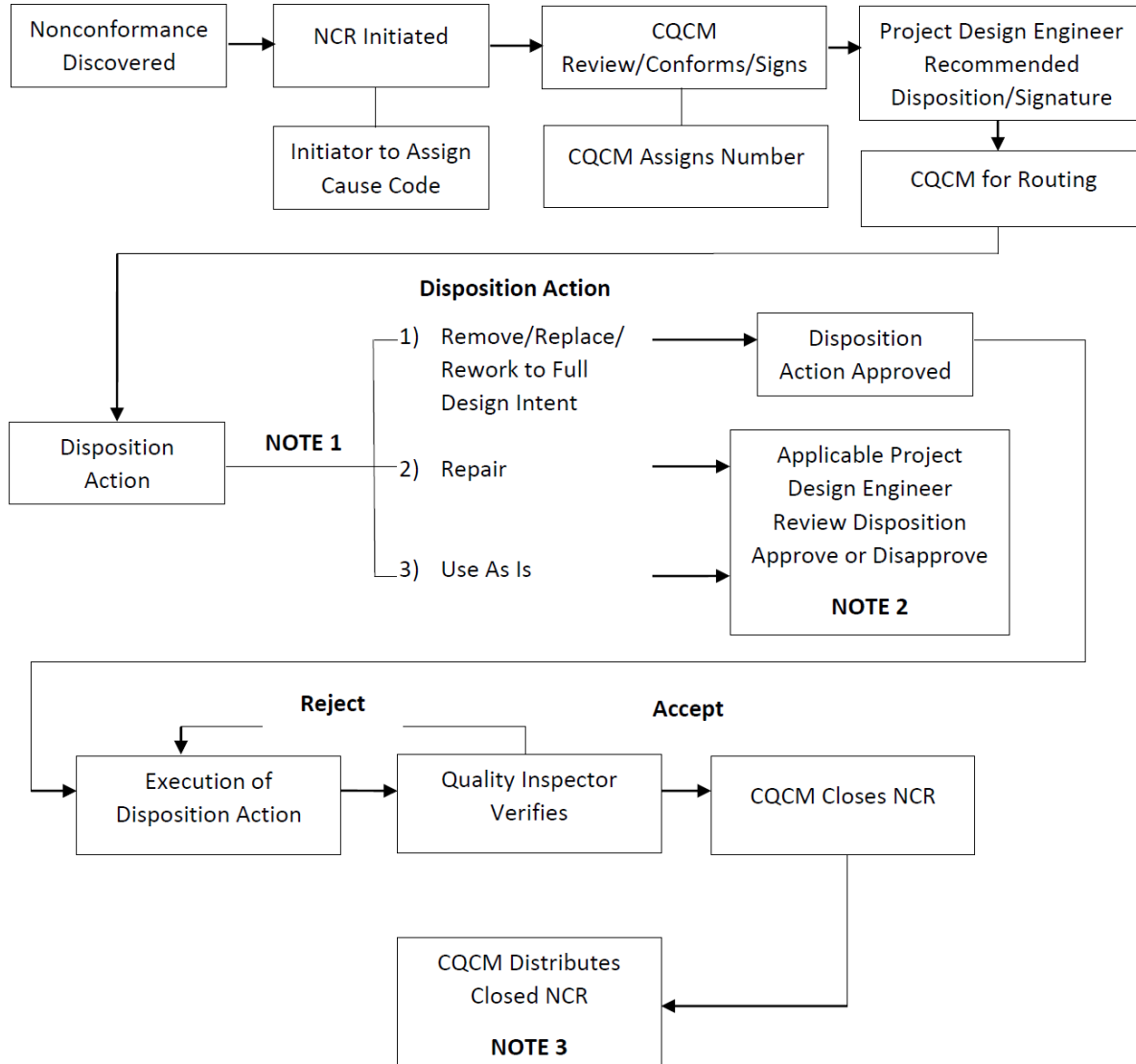
Once implementation is satisfactorily implemented, sign the “Disposition Completed” block.

4 Action verified and Non-Conformance Closed

The TZC, LLC inspector shall indicate the method used for verification of corrective action. Sign the signature block indicating acceptance of corrective action.

5 The TZC, LLC TZC, LLC Construction Quality Control Manager shall review the NCR for completeness and acceptance of the corrective action.

Attachment 2 - Nonconformance Report Routing Chart



NOTE 1: If the disposition is 2 or 3 for a NYSTA or IQAE initiated NCR, NYSTA will need to approve disposition and closure of NCR

NOTE 2: If the disposition is 2 or 3 for a NYSTA or IQAE initiated NCR, NYSTA will need to approve disposition and closure of NCR

NOTE 3: Distribution of reports is to be in accordance with requirements agreed to for the Project



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SECTION 11 – CONTROL OF NONCONFORMANCES FORMS

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NONCONFORMANCE REPORT

Tag Description:	Tag No.:
P. O. No.:	Turnover System:
Subcontractor./Supplier:	Sub – System:
Subcontract No.:	Location:

Initiated by:	Date:	Site Quality Mgr:	Date:	NCR No.
Area/Location	Unit/Equip No.	Discipline/Responsibility:		
DWG. No./Rev.	Spec./Rev.	Audit No. (If Applicable)		

DESCRIPTION OF NONCONFORMANCE

CAUSE CODE(S) _____

DISPOSITION ☐ Use as is ☐ Rework ☐ Repair ☐ Replace

DISPOSITION BY _____
Engineering Manager Date

DISPOSITION COMPLETED BY _____
Constructor Date

Design Eng. Approval Req.

☐ Yes ☐ No

Design Engineer Date

ACTION VERIFIED AND NON-CONFORMANCE CLOSED

VERIFICATION METHOD
☐ DOC REVIEW ☐ INSPECTION ☐ OTHER

TZC LLC CQC INSPECTOR **DATE**

VERIFIED DISPOSITION AND RECOMMENDED CLOSURE OF NCR

TZC LLC CQCM **DATE**



NONCONFORMANCE REPORT LOG

Page _____ of _____

NCR No.	Discipline	Cause Code	Date Opened	Date Closed	Description of Nonconformance



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HOLD TAG/STICKER

**HOLD**

Hold Tag No._____

DO NOT USE

NCR Number_____

(DO NOT REMOVE THIS TAG)

(Recommended Color: Red with Green Letters)



SECTION 12 – CORRECTIVE ACTION

Purpose

TZC, LLC Corrective Action policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.12.2 Corrective Action.

NOTE: This section of the manual is to establish a procedure for construction related corrective actions and, as such, is focused on construction quality control and quality assurance activities. For corrective actions related to design development see the Design Control section of this manual along with the DQCP and DQAP attached to that section.

SCOPE

This procedure establishes the method of obtaining and documenting corrective actions for significant conditions which are adverse to quality, such as failure to properly implement procedures, programmatic failure due to inadequate procedures or failure to correct repetitive problems.

GENERAL

The corrective action process involves:

- Reviewing nonconformities
- Determining their cause
- Evaluating the action necessary to ensure that nonconformities do not recur
- Determining and implementing the action needed
- Recording the results of actions taken
- Reviewing corrective action taken

Definitions

Nonconformity – The non-fulfillment of specified requirements. Also referred to as a nonconformance.

Correction – The correction (fixing) of a nonconforming item to make it acceptable. When correcting an item, consideration should be given to whether other work is also affected.

Corrective Action – The action taken to eliminate the cause(s) of nonconformities. Corrective Action should be appropriate to the magnitude of the problem and commensurate with the risks encountered.

Root Cause – Underlying reason(s) for occurrence of a nonconformity. A root cause is determined through analysis, (e.g. asking the question “why?” until the underlying reason has been revealed).

Responsible Person – The individual responsible for the group or system where a nonconformity is identified. He/she would be responsible for ensuring its timely correction.

Significant Condition – Operating system and/or procedural deficiencies evaluated by management (as to the magnitude of the problem and commensurate to the risks encountered) and judged to warrant a Corrective Action Report (CAR). This also includes where a trend is noted (i.e. the same nonconforming condition occurs three or more times).



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The need for a Corrective Action Report is usually identified by the TZC, LLC Construction Quality Control Manager or inspection personnel; however, any one may identify the need for a CAR.

PROCEDURE

A nonconformity may be identified through activities such as internal audit, surveillance, management review, or an external audit finding.

A nonconformity is evaluated (based on severity) to determine the appropriate level of corrective action needed to prevent recurrence. Consideration is given to the impact of the nonconformity on project cost, schedule or quality issues.

All corrective action reports require root cause analysis and corrective action.

Corrective action is documented on the CAR (Corrective Action Report) form (attached). Prior to raising a corrective action report personnel are required to obtain an agreement with the TZC, LLC Construction Quality Control Manager as to the need to raise a CA instead of a nonconformance report.

Coordination of CARs is the responsibility of the TZC, LLC Construction Quality Control Manager.

When manually completing a CAR sections 1 and 2 of the form are to be completed and the CAR number recorded on a status log (attached). Equivalent forms and logs are permitted providing the essential elements of the example form and log are addressed.

The CAR is transmitted to the Responsible Person for further action. The Responsible Person completes Section 3 and 4 of the CAR form (refer to Attachment 01 – Corrective Action Response Instructions) and returns it to the TZC, LLC Construction Quality Control Manager.

Should it become necessary to void or cancel a CAR during the initiation cycle (upon discovery that no nonconformity actually exists, or a CAR covering this condition already exists), an explanation will be written on the original report. The report will be signed and dated by the responsible person and copies provided to appropriate distribution including the person who identified the deficiency/condition.

The TZC, LLC Construction Quality Control Manager is responsible for ensuring that a root cause analysis was performed, that the nonconformity has been corrected and that the corrective action taken to eliminate the cause of nonconformity is effective. The TZC, LLC Construction Quality Control Manager will also ensure completion of Section 5 of the CAR form and update the Status Log. A completed copy of the CAR form will be retained.

DOCUMENTATION

The Corrective Action Report and associated attachments shall be retained in the Quality Control Files by the TZC, LLC Construction Quality Control Manager. Electronic versions of



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associated attachments can be attached to the CA within the ERMS system. The status of open CAR's will be reviewed with Project Management on a periodic basis to ensure timely close out of the CAR's.

REFERENCES

Quality Control Forms:

Corrective Action Report
Corrective Action Report Log

Attachments

Attachment 1	-	Corrective Action Response Instructions
Attachment 2	-	Corrective Action Report Work Flow



Attachment 1 - Corrective Action Response Instructions for Manual Forms

Note: CAR's completed in ERMS are to follow the instructions built in to the system.

Corrective Action Report (CAR)

The Responsible Person is required to respond to each CAR within a target of 14 days after the issue of the CAR. Responses may be provided on the CAR form, or by other written means. Responses are required to address the following points:

CAR Section 3 – Correction of Nonconformity

Provide a detailed explanation of the action that will be taken to resolve the specific problem identified on the CAR. State when the action has been or will be completed. Identify other work affected and if additional actions or controls are needed.

CAR Section 4 – Corrective Action Section

In addition to correcting the nonconformity, the Responsible Person needs to assess it's severity/impact to see if further analysis is warranted (i.e. determine the root cause and develop a plan to prevent recurrence).

When evaluating the severity of the nonconformity consideration should be given to its impact on project cost, schedule, safety, long-term performance or quality issues (e.g. resulting in excessive rework). This decision is indicated by marking yes or no in section 4 or the CAR.

Root Cause: The underlying reason(s) for the occurrence of the reported nonconformity will be evaluated and the cause code(s) including an explanation will be stated.

Cause Code	Description
C01	Client Driven
C02	Communication Driven
C03	Equipment or Material
C04	External Phenomenon
C05	Location Driven
C06	Management Driven
C07	No Procedure
C08	Procedure/Work Process not followed - select from below
C08a	Not Aware of Procedure (includes not trained)
C08b	Ignored Procedure (includes no time / low priority / not important)
C08c	Misapplied Procedure (includes not understood / thought not to apply)
C08d	Not Effective (needs update / improvement / is inappropriate) / incorrect
C08e	Incorrect Reference to Procedure (includes incorrectly specified)
C08f	Procedure Not in Native Language
C09	People Driven
C10	Systems Driven
C11	Work Environment
C99	Other



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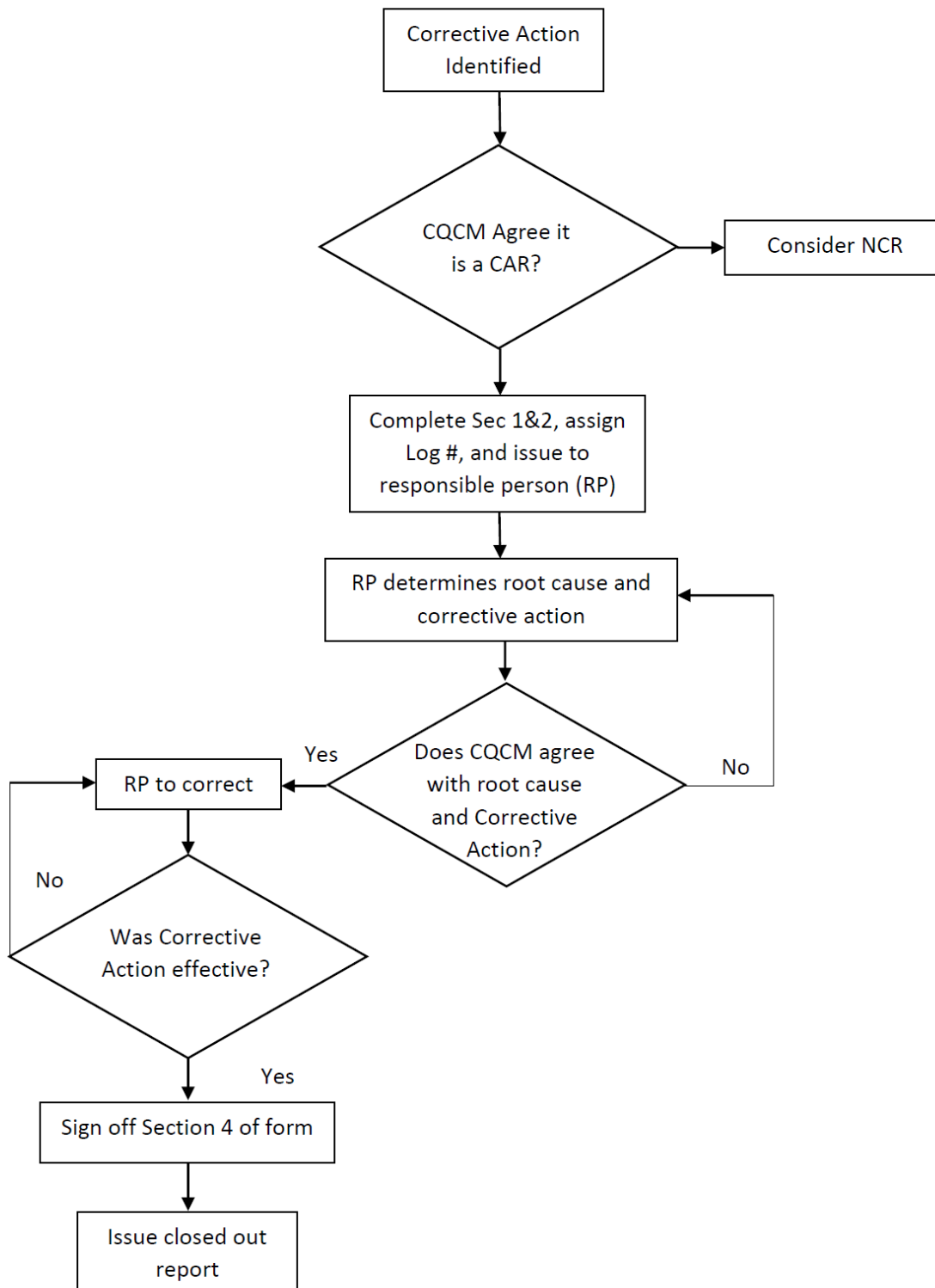
Plan to Prevent Recurrence: Provide details of corrective actions that have been taken or will be taken to prevent recurrence of the condition (root cause) that led to the reported Nonconformity. State when the corrective actions to prevent recurrence have been or will be completed.

Upon completion, sign and date. If issued electronically, name and date may be typed.

Response Coordination and Processing

Upon completion of sections 3 & 4 of the above reports, route to the TZC, LLC Construction Quality Control Manager. The TZC, LLC Construction Quality Control Manager, upon receipt of all responses, provides for follow-up and close-out where applicable.

Attachment 2 – Corrective Action Report Work Flow





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CORRECTIVE ACTION REPORT		
1 - Identification		
Supplier Name:	Contract/P.O. No.:	Date:
CAR Number:		Originator:
Personnel contracted:		Discipline:
2 - Nonconformity		
Reference:		
Requirement:		
Description:		
Contributing Cause(s):		
3 – Correction of Nonconformity (By Responsible Person)		
Plan to address the Nonconformity (e.g. correct/repair/waiver) Estimated Completion Date:		
4 – Corrective Action Section (By Responsible Person)		
Root Cause(s):		
Plan to Prevent Recurrence:		Estimated Completion Date:
Responsible Person:		Date:
5 – Closeout Verification		
Correction of Nonconformity:		
Verifier:		Date:
Corrective Action Implemented and Effective:		
Evaluator:		Date:



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CORRECTIVE ACTION STATUS LOG

CAR No.	Date Initiated	Description of CAR	Contractor/Supplier	Cause Code	Responsible Person	Response Received Date	Date Closed



SECTION 12.1 – PREVENTIVE ACTION

Purpose

TZC, LLC Preventive Action policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.12.3 Preventive Action.

NOTE: This section of the manual is to establish a procedure for construction related preventive actions and, as such, is focused on construction quality control and quality assurance activities. For preventive actions related to design development see the Design Control section of this manual along with the DQCP and DQAP attached to that section.

SCOPE

This procedure provides guidance on methods to identify conditions (or circumstances) which have the potential to cause nonconformities.

GENERAL

Definitions

Preventive Action: The action taken to eliminate the cause of potential nonconformities. Preventive action will be appropriate to the magnitude of the potential nonconformity and commensurate with the potential risks that may be encountered.

Nonconformities: The non-fulfillment of specified requirements.

Preventive action involves the detection and elimination or modification of work performance conditions (or circumstances) which have a potential to cause nonconformities. Each employee should continually evaluate his/her work process to identify potential nonconformities.

PROCEDURE

Project Personnel

Review appropriate sources of information that may be used to identify potential nonconformities such as:

- Internal Quality Audits
- Client Feedback
- Lessons Learned
- Analysis and improvement of work process and operations
- Value Awareness Suggestion
- Monthly Project Reviews
- Employee Suggestions
- Registrar Feedback



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The TZC, LLC Construction Quality Control Manager is aware of the various sources of potential nonconformities listed above and, as appropriate, will determine if an identified item should be considered for preventive action and, if so, will issue one. Consideration should be based on the item's potential impact on project cost, schedule, safety, long-term performance or quality.

NOTE: All potential nonconformities require preventive action.

Potential nonconformities that could adversely affect the Project will have the following steps performed:

- Determine cause of the potential nonconformity and record it on the log. Refer to cause codes listed below.
- Determine what action is required to prevent occurrence of nonconformity (i.e. issue or audit observations, revision of a work process or procedure) and add the appropriate Elimination Code number to the log (See Attachment 1).
- Confirm that action was taken to prevent the potential nonconformity from occurring and record this information in the preventive action log.

Preventive Actions that eliminate potential nonconformities will be submitted for management review.

A log is to be maintained that records a description of the potential nonconformity, the contributing cause (see Cause Code table below), the action determine necessary to eliminate the cause (see Elimination Code table below). It is preferred that the Confirmation of Action section of the log reference a follow-up or audit report that describes what was done to address the issue.

CAUSE CODES	
Code	Description
C01	Client Driven
C02	Communication Driven
C03	Equipment or Material
C04	External Phenomenon
C05	Location Driven
C06	Management Driven
C07	No Procedure
C08	Procedure/Work Process not followed - select from below
C08a	Not Aware of Procedure (includes not trained)
C08b	Ignored Procedure (includes no time / low priority / not important)
C08c	Misapplied Procedure (includes not understood / thought not to apply)
C08d	Not Effective (needs update / improvement / is inappropriate) / incorrect
C08e	Incorrect Reference to Procedure (includes incorrectly specified)
C08f	Procedure Not in Native Language
C09	People Driven
C10	Systems Driven
C11	Work Environment
C99	Other



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ELIMINATION CODES	
Code	Description
E01	Revision/modification of work process/document
E02	Issuance of QA/QC report to affected personnel
E03	Issuance of document/procedure
E04	Training/orientation of affected personnel
E05	Verbally advising affected personnel
E99	Other

REFERENCES

Quality Control Forms:

Preventive Action log

Audit Finding

Audit Summary

Attachments

Attachment 1 – Preventive Action Log

Attachment 2 – Preventive Action Work Flow



Attachment 1 – Preventive Action Log

PA No.	Issue Date	Source	Description	Cause Code	Elimination Code	Confirmation of Action	Verified by	Date Closed

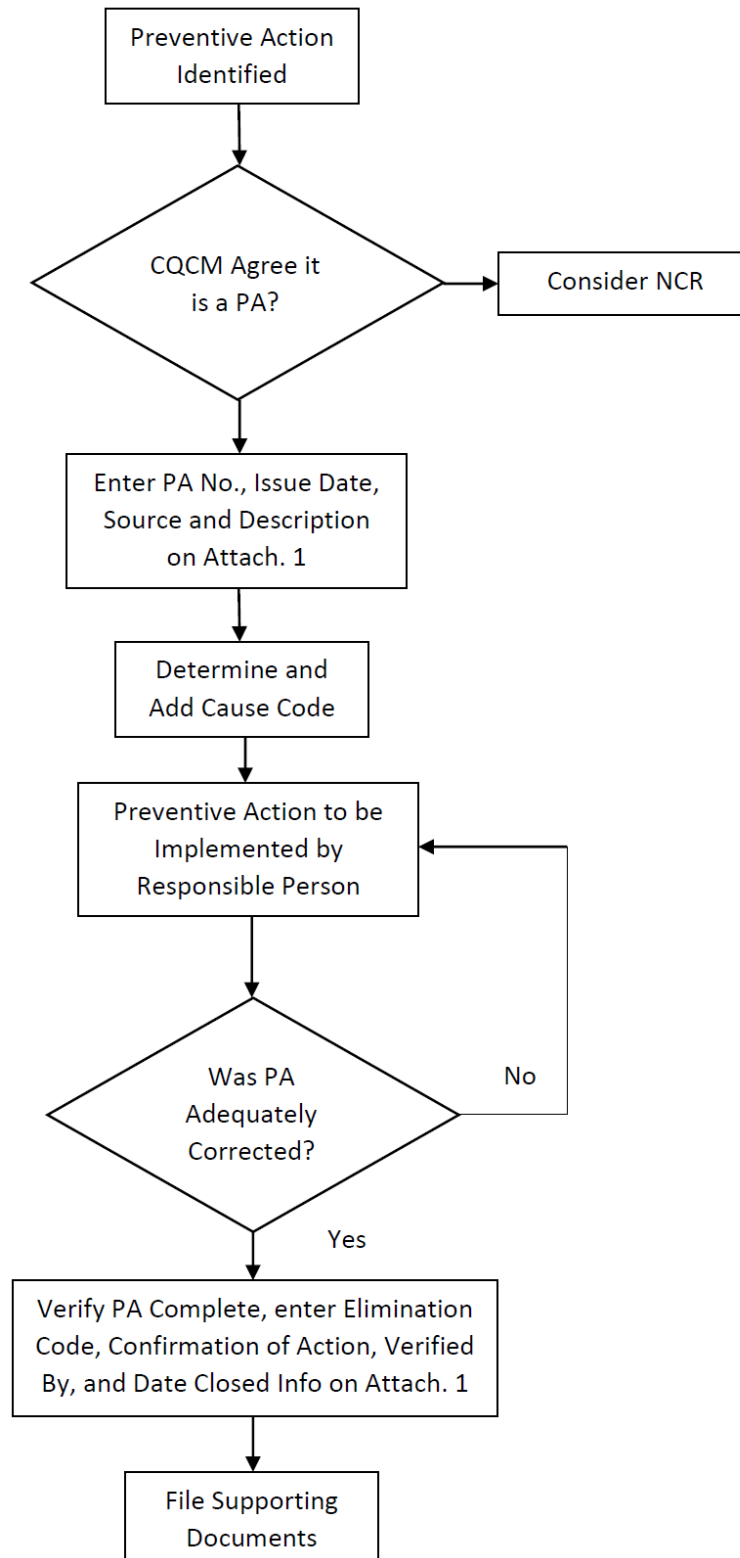
Cause Code	Description	Cause Code	Description	Elimination Code	Description
C01	Client Driven	C07	Procedure (except procedure not followed)	E01	Revision/modification of work process/document
C02	Communication Driven	C08	Procedure/Work Process not followed	E02	Issuance of QA/QC report to affected personnel
C03	Equipment or Material	C09	People Driven	E03	Issuance of document/procedure
C04	External Phenomenon	C10	Systems Driven	E04	Training/orientation of affected personnel
C05	Location Driven	C11	Work Environment	E05	Verbally advising affected personnel
C06	Management Driven	C99	Other	E99	Other



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Attachment 2 – Preventive Action Work Flow





PREVENTIVE ACTION LOG

[illegible]

Cause Code	Description	Cause Code	Description	Elimination Code	Description
C01	Client Driven	C07	Procedure (except procedure not followed)	E01	Revision/modification of work process/document
C02	Communication Driven	C08	Procedure/Work Process not followed	E02	Issuance of QA/QC report to affected personnel
C03	Equipment or Material	C09	People Driven	E03	Issuance of document/procedure
C04	External Phenomenon	C10	Systems Driven	E04	Training/orientation of affected personnel
C05	Location Driven	C11	Work Environment	E05	Verbally advising affected personnel
C06	Management Driven	C99	Other	E99	Other



SECTION 13 – QUALITY RECORDS

Purpose

TZC, LLC Quality Records policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.1.1 Quality System Procedures, Part Y and DB 113-3.14 Control of Records.

Scope

For activities that affect technical quality, TZC, LLC establishes and maintains procedures for quality records. These procedures identify which records should be kept, the responsibility for their production and collection, and the responsibility for their indexing, filing, storage, maintenance, and disposition.

NOTE: TZC, LLC is in the process of establishing a project-wide document control system that will address the Electronic Records Management system required in the Contract. Once this system is implemented it will be addressed in this and other appropriate sections of this manual.

Policy

- Records will be kept to demonstrate the achievement of specified requirements and the effective operation of the TZC, LLC Quality Plan;
- Construction Management Quality Records shall be maintained at the project site;
- Pertinent subcontractor records shall also be part of these quality records;
- Records will be legible and identifiable to the material, equipment or element of work involved, including as applicable title, contract number, date, revision, and an activity description;
- Inspection and testing quality records will have as a minimum the signature of the individual performing the inspection/test, date, and a description of the work being inspected/tested;
- Access to quality related records shall be made available to the Authority's Representative and their auditing agents as required;
- All quality records will be stored and preserved to prevent damage, loss, or deterioration. Records will be easily retrieved and available to authorized personnel; and
- At the conclusion of the project all quality records will be turned over to the Authority.

Responsibilities

- The PM is responsible for ensuring that TZC, LLC policies and procedures for Quality Records are established and implemented and that the provisions of this section are provided to TZC, LLC sub-consultant's through the technical provisions of sub-consultant's contract;
- TZC, LLC key personnel (see the Organization and Responsibilities section of this manual) are responsible for ensuring that TZC, LLC Quality Record policies and procedures are implemented;
- The TZC, LLC Construction Operations manager or designee(s) is responsible for ensuring that TZC, LLC Quality Record policies and procedures are implemented for Construction Contract Administration;



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-
- TZC, LLC document control functions (see Document Control section of this Quality Plan) is responsible for the control, authorization, distribution and/or change of Quality Records issued in accordance with TZC, LLC document control procedures; and
 - The CQAM is responsible for performing audits to verify implementation of the provisions of this section.

Quality Records

Quality Records are defined as those that provide documented evidence of TZC, LLC Quality Plan implementation. Those responsible for production and collection of these records and those responsible for indexing, filing, storage, maintenance, and disposition of these records are identified in the individual sections of this Quality Plan.



SECTION 14 – QUALITY AUDITS

Purpose

TZC, LLC Quality Audit policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-3.1.1 Quality System Procedures, Part Z and DB 113-3.15 Internal Audit.

Scope

This Section applies to TZC, LLC internal Quality Plan audits performed on the TZC, LLC Team and its consultants to ensure that the elements of the quality management system are functioning as intended. **NOTE:** Design and Construction quality assurance identified by DB 111, 112 and 113 are performed by the TZC, LLC independent Quality Assurance Engineer and are not addressed in this procedure.

TZC, LLC Quality Assurance will perform two types of internal quality audits. These are:

- TZC, LLC-wide QMS implementation audits – These audits are focused on the policies and procedures that cross function lines and are not Task specific. These audits are performed on a routine basis, usually once a year, and may include:
 - Management Responsibility;
 - Manual Preparation and maintenance;
 - Document Control;
 - Purchasing;
 - Corrective Action;
 - Quality Records;
 - Quality Audits; and
 - Training.
- Sub-consultant audits – These audits focus on the ability of the sub-consultant to comply with the requirements of their contract with TZC, LLC and TZC, LLC Quality Plan. These audits are performed shortly after the sub-contractor starts work, and then on a routine basis, usually once a year. The audits may include:
 - Management Responsibility;
 - Manual Preparation and Maintenance;
 - Design Control;
 - Document Control;
 - Inspection and Testing;
 - Monitoring and Measuring Equipment;
 - Inspection and Test Status;
 - Nonconformance;
 - Corrective Action;
 - Quality Records;
 - Quality Audits; and
 - Training



Policy

- TZC, LLC shall objectively audit all aspects of its Quality Plan;
- Audits shall be carried out systematically and on a regular predetermined schedule;
- Auditors shall:
 - Have experience or training commensurate with the scope, complexity, or special nature of the activities being audited;
 - Be independent of the activity being audited; and
 - Be responsible for all elements of the audit.
- The audit report, observations and findings shall be based on objective evidence;
- Results shall be documented and brought to the attention of the personnel having responsibility for the area being audited;
- Management personnel responsible for the area shall take timely corrective action on deficiencies found during the audit; and
- Results will be recorded and reviewed by the TZC, LLC Project Manager to assess the Quality Plan's effectiveness.

Responsibilities

- The QM or designee is responsible for scheduling and performing internal quality audits and, if necessary, ensuring there are a sufficient number of trained auditors to meet the audit program requirements;
- The responsible TZC, LLC manager of each function being audited is responsible for investigating, planning and implementing any corrective action agreed upon as a result of an audit; and
- The Project Executive is responsible for authorizing the internal quality audit function and approving the audit schedule and audit resources.

Quality Audit Activities

Planning and Scheduling

An audit schedule is prepared on quarterly basis based on the TZC, LLC design production and construction schedules. As discussed in Scope (above), audits will be scheduled and the schedule distributed to the appropriate personnel. This schedule will be reviewed and updated as needed to reflect any adjustments to the base assumptions (schedules and work plans).

Audit Personnel

Based on the audit schedule resource needs will be determined based on the level of effort and technical expertise required. Should the QM determine that additional audit personnel are required, the PM will be advised and, if deemed appropriate, additional staff will be assigned to assist in the performance of these audits.

The QAM will provide the necessary indoctrination and training for these auditors to ensure that their audit activities are performed in accordance with the appropriate policies and procedures. This training typically consists of:

- Reading the TZC, LLC Quality Plan and appropriate procedures;
- Reading the appropriate Contract documents (i.e., Design Criteria, TZC, LLC Contract checklists, industry standards, etc.);



- Preparing an audit checklist;

Audit Performance

The following steps are followed in conducting a quality audit:

- The auditor notifies the auditee, in writing, a minimum of five days prior to the audit in order to ensure that key personnel are available;
- The audit/surveillance is performed to either written procedures or checklists;
- Prior to conducting the audit, the auditor holds an opening meeting with the auditee to, among other things, review the audit checklist;
- During conduct of the audit, the auditor reviews the appropriate documents and interviews the appropriate personnel to achieve the audit objectives;
- At the conclusion of the audit, the auditor holds an exit meeting with the auditee;
- The auditor drafts a formal audit report summarizing, among other things, deficiencies that require corrective action and provide a copy to the auditee; and
- A formal audit report is issued to the auditee.

Audit Response and Follow-up

Upon receiving the audit report that notes deficiencies, the auditee responds in writing with the following:

- The cause of the deficiency;
- The corrective action(s) being taken;
- The responsibility for corrective action; and
- When corrective action will be complete.

The auditor, in consultation with the QM, either approves or rejects the audit response(s). Rejected audit responses are promptly resubmitted by the auditee until approved by the auditor. Corrective actions are reviewed for effectiveness through written communication, additional audits, and/or surveillance. The QM maintains an Audit Status Log to track open audits and the status of corrective actions. Upon successful closure of an audit, copies will be sent to the responsible parties being audited, the PM, and those managers having responsibility in the areas audited. The original audit will be sent to document control for permanent record retention.

Management Review

A monthly report is prepared and submitted by the QM to the Project Executive. The report presents sufficient information on the QA Program operations and audit findings to permit an evaluation of the program's effectiveness by management.



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AUDIT FINDING

1) Project/Contract
Number: _____ Finding Number: _____
Project Name: _____ Audit Date: _____
Auditor(s): _____
Auditee Personnel Contacted: _____

2) A. Reference:

B. Requirement:

Continued on back ☐

3) Deficiency:

Continued on back ☐

4) Proposed Disposition:

Expected Completion
Date: _____

5) Corrective Action Evaluation, and Response:

Disposition (Action taken to correct deficiency)

Completion
Date: _____

6) Auditee Signature: _____

Date: _____

7) Auditor Concurrence with disposition:

Date: _____

Continued on back ☐

8) Auditor Follow-up and Close-out Verification:

Auditor Signature: _____

Date Deficiency
closed: _____



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AUDIT REPORT				
Discipline/ Contractor _____ Construction Audit Number: _____ Contract No. _____ Audit Dates: _____ Audit Location: _____ Report Date: _____				
Audit Scope:				
SUMMARY OF AUDIT RESULTS				
NAME	FUNCTION/TITLE	ENTR MTG	EXIT MTG	INTER- VIEWED
Nonconformances Raised: (see attached reports)				
Recommendations:				

REMARKS:

RECOMMENDATIONS:

PREVIOUS NONCONFORMANCES AND ACTION FOLLOW-UP		
Nonconformance Number	Status – Open or Closed	Date Closed

AUDITOR		DATE	
---------	--	------	--



SECTION 15 – PERSONNEL COMPETENCE, TRAINING AND QUALIFICATION

Purpose

TZC, LLC Personnel Competence, Training and Qualification policies and procedures are established and maintained in accordance with the provisions of this Section. This Section is also developed to comply with NYSTA DB Section 113-1.1 Quality System Procedures, Part I and DB 113-4 Personnel Training.

Scope

TZC, LLC personnel competence, training and qualification policies and procedures are established and maintained for identifying the training needs of TZC, LLC team members and sub-consultants and training of all personnel performing activities affecting quality.

Policy

- All personnel performing activities affecting quality shall be qualified on the basis of appropriate education, training, certification (as applicable) and experience;
- Position descriptions shall be developed for personnel performing activities affecting quality;
- As a minimum TZC, LLC team members shall receive training in the Quality Plan and applicable quality requirements; and
- Appropriate training and qualification records shall be maintained.

Responsibilities

- The PM is responsible for ensuring that TZC, LLC policies and procedures for Training are established and implemented;
- The design and construction managers are responsible for assessing the qualifications and training needs of the personnel assigned to them, ensuring that only personnel that are suitably qualified perform tasks affecting quality; and
- The QM or designee is responsible to provide training on the Quality Plan.

Training Activities

Personnel Qualification

The design and construction managers review the qualifications of their personnel. This typically consists of reviewing the individual's education, experience, background, licenses, certifications, special training, etc. The manager may also use a personal interview, review of previous work product, and/or employment reference to provide additional information for this assessment. The manager maintains records that document this review (resumes, copies of licenses, certificates, interview notes, etc.).

Identifying Training Needs

Based on a review of personnel qualifications and / or on-the job performance, design and construction managers will identify training needs as follows:

- Develop small group training sessions to familiarize team members with special and / or new requirements or the introduction of new technology; and
- Request formal training (see below) or for the individual.



TZC, LLC has identified the following as mandatory training for the appropriate TZC, LLC Team members:

- Quality Plan policies and procedures – all team members

Training

The training will be performed to written procedures, manual, or instruction, and documented. Where the more formal training is conducted, the parties responsible for conducting the training will produce and collect those training records and submit them to TZC, LLC Document Control. In the case where design and construction managers develop and conduct specialized training, records will be produced and collected maintained by that manager, and submitted to TZC, LLC Document Control.