

**APPENDIX E**  
**COMMISSIONING PLAN**

CITY OF WINNIPEG

South End Sewage Treatment Plant  
(SEWPCC) Primary Clarifier  
Refurbishment Works

Commissioning Plan

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Revision:

Final

KGS Group Project:

21-0107-003

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## 1.0 COMMISSIONING PLAN OVERVIEW

The South End Sewage Treatment Plant (SEWPCC) is the second largest of the three (3) sewage treatment plants servicing the City. The SEWPCC is located at 100 Ed Spencer Drive in Winnipeg, Manitoba. It has three (3) existing rectangular clarifiers that are used to provide for the initial primary treatment of the wastewater after grit removal and screening. Each primary clarifier generally consists of a rectangular concrete tank equipped with a travelling bridge mechanism to collect the sludge at the bottom of the tanks as well as the scum that floats at the surface. The three (3) tanks are located to the west of the existing grit building. Each Primary Clarifier Travelling Bridge (PCTB) has a reversing motor mounted on the bridge for moving the unit back and forth in an east-west direction. Each bridge mechanism is controlled from a local control panel mounted directly on the travelling bridge.

In 2018, the drive system, rails, and cog track were refurbished on PCTB No. 3 as part of a separate project, referred to as “Phase One”. The local control panels were replaced in 2018 along with other electrical and control works on all three clarifiers. During the future 2021/22 shut-down, or “Phase Two”, refurbishment of the bridge drive and rail components will be completed on the Nos. 1 and 2 clarifier PCTBs. This Commissioning Plan provides details on how the PCTBs and their associated equipment will be brought on-line and verified while maintaining plant operations.

### 1.1 Participants

Commissioning for the refurbished PCTBs will require the participation of the following organizations to verify the performance of the equipment and systems:

- Contractor or General Contractor and any applicable sub-contractors – Winning Proponent.
- Original Equipment Manufacturer (OEM) – Walker Process or Dorr Oliver, depending on unit.
- Contract Administrator – KGS Group.
- City – City of Winnipeg.

### 1.2 Roles and Responsibilities

The Contractor is to provide comprehensive planning and leadership for the commissioning of the works and is responsible for ensuring that all commissioning activities are carried out to allow for the delivery of a fully operational facility that is compliant and complete. The Contractor will provide sufficient personnel to develop, manage and implement the commissioning works as illustrated by Table 1 below.

TABLE 1: ROLES AND RESPONSIBILITIES

Item	Task Description	Organization	Responsibility	
			Department (If Applicable)	Individual (If Applicable)
1	Safely perform all pre-commissioning, commissioning and performance verification activities.	Contractor		
2	Safely operate the equipment as required to perform commissioning activities.	Contractor		
3	Document equipment and control system settings.	Contractor		
4	Provide operations and maintenance manuals.	Contractor		
5	Provide as-built drawings.	Contractor		
6	Schedule and coordinate commissioning works.	Contractor		
7	Prepare agenda and record minutes of commissioning meetings.	Contract Administrator		
8	Track deficiencies, record corrective measures	Contract Administrator	MECH ELEC	Colburn H. Dennis G.
9	Supply commissioning record sheets, test forms, and other documentation.	Contractor		
12	Review and approve commissioning handover package.	Contract Administrator	MECH ELEC	Colburn H. Dustin W.
13	Start-up and shut down the clarifiers as required for the commissioning work.	City		
14	Apply and remove safety lockouts as required.	City		
15	Verify existing DSC interface to new PLC.	City		
16	Monitor alarms during performance verification.	City		

## 1.3 Schedule

The anticipated commissioning schedule will occur as described in the most recent revision of the project schedule, see Appendix A for a proposed project schedule that is trimmed to show only commissioning related tasks.

Pre-commissioning and start-up tasks will be started prior to the completion of the refurbishment in order to allow for the minimum amount of down time for the clarifier. After the completion of refurbishment there is a five (5) working day period of time to allow for commissioning, training, and maintenance/performance verification. The clarifier will be in full operation for the duration of the maintenance/performance verification, and so training to operate the system controls will be required beforehand. The City has indicated that two (2) days should be allowed for maintenance/performance verification before proceeding with the shutdown of the next clarifier.

Only one tank can be removed from service at a time with City's preference to start draining the tank on a Friday, to have that tank empty, washed down and ready for the following Monday. The City will not remove a clarifier from service until the Contractor has received all the parts required for the refurbishment works.

## 2.0 COMMISSIONING SPECIFICATIONS

Specifications for the commissioning process provide information for the start-up, testing, operation and acceptance criteria for the refurbished PCTBs. The commissioning specification includes the following:

- Descriptions of start-up, pre-commissioning, commissioning, and performance verification activities.
- List of the applicable checklists and test records.
- Requirements for the training of the City plant operations staff.
- Requirements for the operations and maintenance documents.

The general commissioning specifications applicable to the refurbishment works include the following:

1. The Contractor shall submit completed testing and field commissioning record sheets on which the results of the various checks and tests shall be recorded, dated, and approved by the OEM and/or installation contractor and the Contract Administrator. Commissioning inspection and testing record sheets are contained in Appendix B.1 (electrical systems) and B.2 (mechanical).
2. The Contractor shall advise the Contract Administrator and the City in writing when the work may be inspected before proceeding with the next commissioning task. The equipment and systems shall not be started before the approval of the Contract Administrator has been obtained.
3. The Contractor is responsible for providing the necessary tools, materials, and equipment for conducting the required tests.
4. Any defects that become evident during commissioning shall be immediately corrected at the Contractor's expense and the test repeated until the work is proven satisfactory.
5. Testing, at a minimum, shall prove the following:
  - a. All clearances and alignments are in order.
  - b. Lubrication is adequate.
  - c. Control devices operate correctly and satisfactorily.
  - d. All circuits, controls and interlock sequences of operation are correct.
  - e. All protective and indicating devices operate satisfactorily.
  - f. Motor running currents under no load (decoupled motor) and full load are within acceptable ranges.
6. The Contractor is responsible for submitting the Operation and Maintenance (O&M) Manuals in accordance with the technical specifications. The O&M Manuals must be provided in pdf and in a searchable format.
7. Upon completion of the project the final hand-over package shall be submitted by the Contractor to the Contract Administrator. It shall include all as-built drawings, installation records, and commissioning records.



8. Upon completion of Performance Verification, the Contractor shall submit:
  - Completed form CD-PM-TO-16 Certificate of Equipment Satisfactory Performance Form 103 (see Appendix C).
  - Complete form CD-PM-TO-17 Certificate of Satisfactory Process Performance Form 104 (see Appendix C).

The commissioning tasks are broken up by discipline. For each of the tasks outlined below, detailed procedure and record sheets must be provided or developed to document the commissioning of the PCTBs. The Contract Administrator will monitor the commissioning activities as specified in Section 2.0; and upon satisfactory completion of the commissioning, will review the documentation provided by the contractor. The Contractor shall be responsible for the commissioning work under the review of the Contract Administrator.

## 2.1 Mechanical

The mechanical commissioning tasks below apply to all three (3) primary clarifiers.

### 2.1.1 PRE-COMMISSIONING

1. Verify that all steps listed in the Inspection and Test Plan documents in the mechanical portion of the technical specification have been fully signed off and completed.
2. Mark or tag any part that was installed, aligned, and/or torqued during the work to confirm that each part has been installed, aligned, or torqued adequately.
3. Carry out a follow up check on all equipment of the tags and marks to verify that no parts or pieces are incompletely installed (i.e. no loose bolts etc.).

### 2.1.2 COMMISSIONING

1. Test run the PCTB along the full length of the rails without the scraper arm assembly attached and with the clarifier empty. The unit should travel smoothly at the design speed (see OEM manual). Compare the motor operating current to the current listed in the bridge drive motor datasheet and to measurements taken prior to the start of work. Current more than this value indicates the presence of excess friction or binding acting on the drive system.
2. Test run the PCTB with the scraper arm assembly attached and with the clarifier empty. Confirm the same minimum performance requirements stated in Item 1.
3. Test run the PCTB with the scraper arm assembly attached and with the clarifier full. Confirm the same minimum performance requirements stated in Item 1.
4. Complete one commissioning inspection and testing record sheet per PCTB (see Appendix B.2).

### 2.1.3 PERFORMANCE VERIFICATION

1. Visually inspect the PCTB daily during regular operation until turned over to the City for use. Report any defects.

Refer to Appendix B.2 for relevant City of Winnipeg Mechanical Checklists to be employed during commissioning. Any forms not provided that are necessary to show completion of the tasks described shall be developed by the contractor in an organized fashion, in a computer-generated format.

## 2.2 Electrical

### 2.2.1 PRE-COMMISSIONING

1. Verify all motors rotate in the correct direction.
2. Verify that all motors operate as required in both automatic and manual modes.
3. Verify that all power feeders are installed and terminated, and the disconnect switches are operational.
4. Verify the insulation resistance of all new power feeders between the motor starters in the control panels and disconnect switches, and between the disconnect switches and the motors. Ensure all feeders are not terminated to the motors, motor starters and disconnect switches during testing.

### 2.2.2 COMMISSIONING TASKS

1. Verify the new power supply connections between the motor starters in the control panels and disconnect switches, and between the disconnect switches and the motors.

### 2.2.3 PERFORMANCE VERIFICATION

1. Verify the voltage and current monitoring and recording (logging) of the bridge drive equipment under various operating scenarios.
2. Complete form CD-PM-TO-16 Certificate of Equipment Satisfactory Performance Form 103 see Appendix C.

Refer to Appendix B.1 for relevant City of Winnipeg Electrical Checklists to be employed during commissioning. Any forms not provided that are necessary to show completion of the tasks described shall be developed by the contractor in an organized fashion, in a computer-generated format.

### 3.0 TRAINING SESSIONS

A reduced scope for training is anticipated for the 2021 refurbishment work for the following reasons:

- The PCTB drive and rail components are replaced with the same OEM components as were previously installed on the PCTB. As such, no changes are anticipated for the function of the PCTBs.
- The control panels on all three (3) PCTBs were replaced during the 2018/2019 refurbishment, and plant staff were trained in the operation of the HMI panels at that time.

The objectives of the training are to provide City personnel with the following information:

1. A detailed description of the extent of structural, electrical, and mechanical work done on the PCTBs during the shut-down period.
2. Recommended preventative maintenance practices along with diagnosis and trouble-shooting information.
3. A review of O&M Manual documentation

For the training sessions, the OEM (with support from the Contractor) will provide a description of the existing systems with instruction on the design philosophy, criteria, and intent. The Contractor is responsible for the coordination, quality assurance, overall packaging and presentation of two (2) one (1) hour classroom sessions to provide training to two (2) groups of City personnel.

The City is responsible for providing appropriate personnel to participate in the training for the operation and maintenance of the facility.

All training materials are to be in an acceptable digital format to the City that permits future training procedures that provide the same degree of detail.

## 4.0 O&M MANUAL

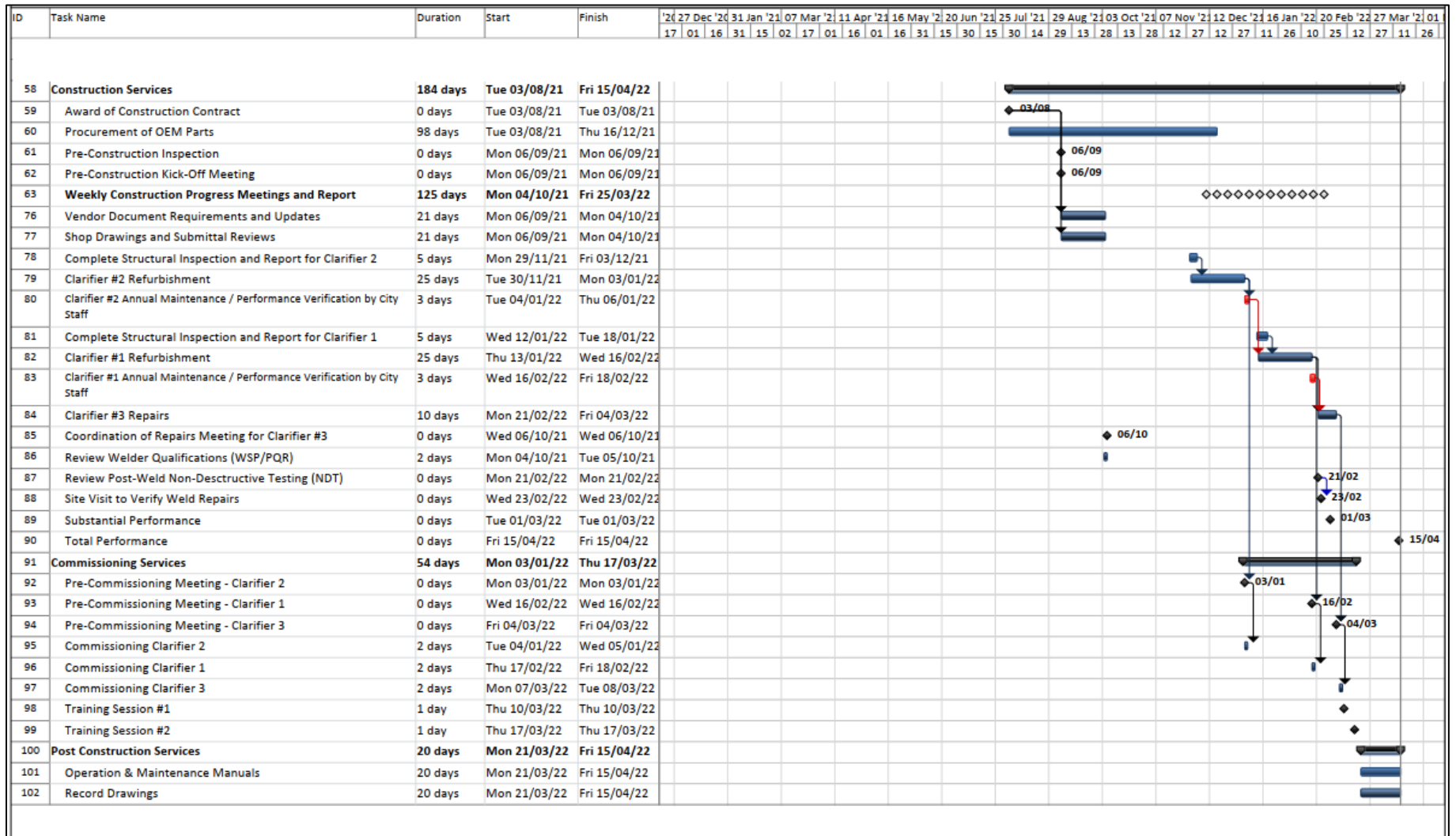
Final review and approval of all training manuals and materials is required by the City prior to the training sessions. Submission of the O&M Manual must be within a two-week period after Substantial Completion. Recommended Preventative Maintenance procedures shall be provided by the OEM and Contractor in document format prior to Substantial Completion. Training materials in general will include the following:

1. "As-Built" Contract Documents.
2. Operating Manuals (pdf and searchable format).
3. Maintenance Manuals (pdf and searchable format).
4. Shop Drawings.
5. Product Information (PI) Sheets.
6. Supplemental training materials like presentations, training videos and/or equipment models.
7. Video recording of training sessions.

# **APPENDIX A**

Proposed Commissioning Schedule

## Proposed Commissioning Plan Schedule



# **APPENDIX B.1**

City of Winnipeg Electrical and  
Instrumentation Commissioning  
Checklist

<b>Project</b>	Facility:	Project Name:
	Area :	Bid Opportunity:

<b>Cable Data</b>	Source:		Dest. / Load:	
	Manufacturer:		Type:	Conductor: <input type="checkbox"/> Copper <input type="checkbox"/> Aluminum
	No. of Conductors:	Size: <input type="checkbox"/> AWG <input type="checkbox"/> MCM	Length: m	<input type="checkbox"/> Measured <input type="checkbox"/> Previous Data <input type="checkbox"/> Jacket Markings <input type="checkbox"/> TDR
	Rated Voltage: V	Operating Voltage: V	Date Installed:	
	Installation: <input type="checkbox"/> Cable Tray <input type="checkbox"/> EMT <input type="checkbox"/> Alum. Conduit <input type="checkbox"/> Direct Buried <input type="checkbox"/> Strapped <input type="checkbox"/> Steel Conduit <input type="checkbox"/> PVC Conduit <input type="checkbox"/> Underground Duct		Other:	

<b>Visual Inspection</b>	Physical Damage on Exposed Ends: <input type="checkbox"/> Yes <input type="checkbox"/> No	Cable Identification Tag Installed: <input type="checkbox"/> Yes <input type="checkbox"/> No
	Visual Signs of Overheating: <input type="checkbox"/> Yes <input type="checkbox"/> No	Cable Supported Appropriately: <input type="checkbox"/> Yes <input type="checkbox"/> No
	Bend Radius Acceptable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Comments:

<b>Insulation Resistance Test</b>	Test Preparation: <input type="checkbox"/> Disconnected <input type="checkbox"/> Connected with Source Isolated	Source: <input type="checkbox"/> Disconnected <input type="checkbox"/> Connected with Load Isolated	Cable Dest. / Load: <input type="checkbox"/> Disconnected <input type="checkbox"/> Connected with Load Isolated	Note: Approval of City's Representative is required, prior to leaving cables connected during the test.	
	Cable Temperature: °C		Temperature Correction Factor for 20°C:	Ground all conductors not under test for each reading.	
	<b>Test Voltage</b>	<b>Insulation Resistance (MΩ)</b>			<b>Test Summary</b> <input type="checkbox"/> Test Passed <input type="checkbox"/> Test Inconclusive Further Investigation Required. <input type="checkbox"/> Test Failed
		A-GND	B-GND	C-GND	
	V	Reading			
	Corrected to 20°C				
Utilize 1000VDC Test Voltage for 600V rated cables, 500VDC for cables rated <= 300V.					
Comments:					

<b>Connection Resistance</b>	<i>Note: Torque check required for all cables. Connection Resistance Test required for cables 4/0 AWG or larger.</i>					
	<b>Termination</b>	<b>Connection Resistance (μΩ) - As Left</b>				<b>Torque Check</b>
		A	B	C	N	
	Source					<input type="checkbox"/> OK
	Dest. / Load					<input type="checkbox"/> OK
Comments:						

<b>Final Analysis</b>	Cable Returned to Service: <input type="checkbox"/> Yes <input type="checkbox"/> No	Comments:
	Monitoring / Further Inspection Required: <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Repair / Replacement Required: <input type="checkbox"/> Yes <input type="checkbox"/> No	

	<b>Company</b>	<b>Name</b>	<b>Signature</b>	<b>Date (yyyy/mm/dd)</b>
<b>Performed By</b>				
<b>Checked By</b>				



# **APPENDIX B.2**

City of Winnipeg  
Mechanical Commissioning  
Checklist



# COMMISSIONING MECHANICAL CHECKLIST

### Project

Facility: SEWPCC	Project Name: SEWPCC PRIMARY CLARIFIER TRAVELLING BRIDGES – REFURBISHMENT WORKS
Area : Primary Clarifier No. ##	City Bid Op. # 391-2021

### Equipment List

Tag:	Description: Travelling Bridge Collector	
Manufacturer:	Model:	Serial Number:

### Inspection Checklist

No.	Item to be Inspected	Comments	Pass (P/F)
1.	Test run the bridge collector along the full length of the rails without the scraper arm assembly attached and with the clarifier empty. See OEM manual for design speed. See bridge drive motor datasheet for operating current.		
	<b>Company</b>	<b>Name</b>	<b>Signature</b>
<b>Tested By</b>			<b>Date (yyyy/mm/dd)</b>
<b>Witnessed By</b>			

No.	Item to be Inspected	Comments	Pass (P/F)
2.	Test run the bridge collector with the scraper arm assembly attached and with the clarifier empty. Confirm the same minimum performance requirements stated in item 1.		
	<b>Company</b>	<b>Name</b>	<b>Signature</b>
<b>Tested By</b>			<b>Date (yyyy/mm/dd)</b>
<b>Witnessed By</b>			

No.	Item to be Inspected	Comments	Pass (P/F)
3.	Test run the bridge collector with the scraper arm assembly attached and with the clarifier full. Confirm the same minimum performance requirements stated in item 1.		
	<b>Company</b>	<b>Name</b>	<b>Signature</b>
<b>Tested By</b>			<b>Date (yyyy/mm/dd)</b>
<b>Witnessed By</b>			

Comments:

# **APPENDIX C**

Performance Certificate Forms



Water and Waste Department • Service des eaux et des déchets

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**Form 103**

**CERTIFICATE OF EQUIPMENT SATISFACTORY PERFORMANCE**

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We certify that the equipment listed below has been continuously operated for a minimum of three (3) consecutive days and that the equipment operates satisfactorily and meets it's specified operating criteria. No defects in the equipment were found and as such are classified as "conforming".

**Project:**

**Equipment Description:**

**Equipment Supply Bid Opp. No.:**

**Equipment Install Bid Opp. No.:**

**Equipment Tag No.:**

**Specification Reference:**

\_\_\_\_\_  
(Authorized representative of Supply Contractor)

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Authorized representative of Install Contractor)

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Authorized representative of Contract Administrator)

\_\_\_\_\_  
Date



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**Form 104**

**CERTIFICATE OF SATISFACTORY PROCESS PERFORMANCE**

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We certify that the process system listed below has been continuously operated and tested as per the Specifications using process fluid and that the equipment meets its Performance Testing and Operating Criteria. No defects in the process system were found and as such are classified as “conforming”.

**Project:**

**Equipment Description:**

**Equipment Supply Bid Opp. No.:**

**Equipment Install Bid Opp. No.:**

**Equipment Tag No.:**

**Specification Reference:**

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(Authorized Representative of Supply Contractor)

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Date

---

(Authorized Representative of Install Contractor)

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Date

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(Authorized Representative of Contract Administrator  
i.e. Commissioning Lead or Design Discipline Lead)

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Date

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(Authorized Representative of City)

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Date

**KGS**  
GROUP

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Experience in Action