PROCEDURES MANUAL

FOR RICHMOND UTILITIES

INFRASTRUCTURE DEVELOPMENT

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Volume 2 of 4

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INTRODUCTION

The Inspector's job is vital to achieving high quality construction on every utilities infrastructure project. It is one of verifying that construction operations produce the results called for by the Plans and Specifications. This role is one of the toughest jobs in construction industry and demands knowledge, awareness, keen observational skills, and diplomacy. The Inspector has the responsibility to identify deviations from project Plans and Specifications and to bring them to the attention of the Contractor, Engineer and Richmond Utilities. This manual provides the Inspector the knowledge of practice and policy required during the construction of utilities infrastructure at Richmond Utilities.

PURPOSE OF INSPECTION

The purpose of inspection on construction projects is to ensure the **quality** of the work, and to verify that the finished construction meets project requirements. To accomplish this, the Inspector must be familiar with the Plans and Specifications. Together the Plans and Specifications explain requirements that the Contractor must observe to install or build a satisfactory project and receive payment in full for his work.

Plans are the Contract Documents that show the location, physical aspects, and dimensions of the work. The Plans include layouts, profiles, cross-sections, and other necessary details. The Specifications are the written technical directions and requirements for the work. Also, the Specifications complement the Plans by providing instructions that are not specifically indicated on the drawings. Specifications are the means of communications among the Engineer, the Contractor and Richmond Utilities. The Plans and Specifications are dynamic documents, subject to revisions as unknown conditions and requested design changes are encountered on the project. Therefore, it is imperative that the Inspector maintain a current awareness of these documents.

QUALIFICATIONS OF INSPECTOR

The personal attributes of the Inspector extend beyond those expected of ordinary workman or technician. The Inspector must be:

- honest and able to conduct himself/herself in a fair, straight forward professional manner;

- able to maintain his/her composure and make good decisions; and

- a skilled diplomat, able to handle tough situations without causing hostility.

In addition to these positive personal attributes, the Inspector must have the organizational and technical ability to perform his/her job. The Inspector shall have a high school diploma and technical background, preferably with additional technical study or previous construction experience. The Inspector must:

- know how to read and interpret Plans, Specifications, and other documents to understand the requirements of the work;

- be able to observe ongoing construction progress, and identify existing or potential construction operations that are not according to the Plans and Specifications;

- have the verbal communication skills to notify the Contractor in a courteous manner that unsatisfactory conditions exist, or that the Specifications are not being met;

- have the writing skills to properly document and record the daily work progression and any factors affecting the progress or quality of the work;

- be able to perform accurate mathematical calculations;

- be knowledgeable of the physical characteristics of the materials involved in construction projects; and

- understand the principles of materials testing, including the interpretation of test results.

INSPECTOR AUTHORITY

The Inspector is responsible for determining that the work being done and the materials being used meet the requirements of the Plans and Specifications. The Inspector has the authority to reject defective material or work that is being done improperly. The Inspector also has the authority and obligation to notify the Contractor when unusual conditions have been created or encountered during construction. The Inspector should realize that implementation of the authority should be regularly supplemented with advice and assistance from the Engineer.

The Inspector should realize that he/she is not authorized to revoke, alter, or relax any requirements of the Contract; or to issue a Stop Work Order to the Contractor. These actions are among the responsibilities of the Developer’s Engineer and The Richmond Utilities Board.

CONSTRUCTION INSPECTION MANUAL
PRECONSTRUCTION & POST CONSTRUCTION RESPONSIBILITIES

INTRODUCTION

During the pre-construction phase, the Inspector shall review all required aspects of the project, and shall try to resolve any errors or conflicts which he/she observes. In general, the Inspector shall obtain and review all Contract Documents, review pertinent engineering reports, visit the job site prior to construction, and attend the pre-construction conference.

During the post construction period, the Inspector shall review and verify that all aspects of the job have been completed, and shall review project record documentation for accuracy and completeness.

Definitions

Benchmark - Point of known or assumed elevation used as a reference in determining and recording elevations.

Punch List - A summary of additional or corrective work required for completion of a project usually prepared after a site walk-over.

Record Drawings (As-Builts) - Engineering plans which have been revised to reflect all changes to the plans which occurred during construction. The Record Drawings also depict water and sewer appurtances locations, in accordance to the Standard Guidelines and Details for Water and Sanitary Sewer Construction Drawings Manual.

Subgrade - Soil exposed in a trench or roadbed and upon which the pipe bedding material or pavement base material will be placed.

PRE-CONSTRUCTION RESPONSIBILITIES

The Engineer's inspector is required to attend the pre-construction meeting. The Inspector is responsible for having a thorough understanding of the project Plans and Specifications and other appropriate parts of the Contract Documents. A complete and knowledgeable understanding by the Inspector of these documents is essential in performing proper inspections during construction. The Specifications represent detailed descriptions of the materials, workmanship, and testing methods required on the project. The Plans present layouts, profiles, dimensions, cross-sections, and details necessary to construct the project. Together, these documents define the scope and nature or the work to be performed.

During this review, the Inspector shall make note of any items in the Contract Documents which are unclear and discuss these with the Engineer. In addition, and detected errors, omissions, discrepancies, or deficiencies shall be reported to the Engineer and Richmond Utilities. At this time, any questions by the Inspector regarding the contents of the Contract Documents or scope of project shall be resolved.

Site Visits

The Inspector shall visit the site prior to construction, and shall walk the site with the Plans in hand. At this time, the Inspector shall become familiar with the proposed area of construction and the proposed locations of all structures and earthwork indicated on the Plans. The Inspector shall look for any obvious errors in the Plans, as well as any areas which may require special attention during construction. All items for concern, error, or discrepancies noted by the Inspector shall be discussed with the Engineer and Richmond Utilities Coordinator during the pre-construction meeting, as appropriate.

During the site visit, the Inspector shall look for the following items:

(1) job site alterations which may have occurred since preparation of site plans contained within the Contract documents;

(2) the obvious presence of any existing utilities which are not marked on the Plans but which may present problems during construction;

(3) the location of any trees or plants which are marked “Do Not Disturb” on the Plans. These trees/plants shall be marked by the Contractor with flagging to avoid any possible confusion later;

(4) the location of any bench marks (BMs) or temporary bench marks (TBMs) shown on the Plans. The Inspector shall confirm the bench mark locations are as shown on the Plans. If the bench marks have been obviously disturbed, they shall be replaced prior to construction.

In addition, during the site visit, the Inspector shall take a series of pre-construction photographs. These photographs shall be logged and indexed to allow future reference, if necessary.

Pre-Construction Conference

A pre-construction conference will be scheduled by the Richmond Utilities Project Coordinator and the Developer, Developers Engineer, Contractor, Inspector as well as other appropriate Richmond Utilities Staff shall attend. During the conference, matters such as the coordinating work, construction schedule, traffic controls, utility conflicts, and special construction considerations are addressed. The Inspector shall make it a point to introduce himself/herself to each contact, and begin building professional relationships to ensure open communication throughout the project.

POST-CONSTRUCTION RESPONSIBILITIES

Preparation of Punch List

After Richmond Utilities activates the subject utilities, the Inspector shall assist the Project Coordinator, Engineer and Contractor with preparing a punch list that itemizes all of the work tasks still necessary for completion of the project. When preparing the punch list, the Project Coordinator and/or RU Staff, Inspector, Engineer and Contractor shall walk the project site and note any areas which require additional or corrective work. The field review shall be very thorough because successful completion of these tasks will indicate that the project is complete. During this walkover, the project status can be reviewed and discussed in detail to avoid any misunderstanding of the work required for final acceptance.

As the Contractor completes items on the punch list , Richmond Utilities Staff and the Inspector shall inspect each item. Items on the punch list shall be checked off only when Richmond Utilities and the Inspector has reviewed the work and decided that it is acceptable. The project is considered completed after all items on the list have been checked off and approved by Richmond Utilities.

Review of Record Drawings (As-Builts)

The project Record Drawings are a set of drawings that illustrate the as-constructed details and layout of the project as described in "Richmond Utilities Standard Guidelines and Details for Water& Sewer Construction Drawings". The Engineer shall be responsible for maintaining and updating the Record Drawings as construction progresses to reflect:

- minor design changes,

- deviations from the original Plans,

- unknown field conditions, and

- unknown utilities locations.

These drawings are important because they represent the final record of the constructed facility; These drawings are often relied upon for reference during future maintenance and expansion of the infrastructure system.

The Inspector, as a result of his intimate knowledge of day-to-day construction activities shall regularly review the Record Drawings, with the Richmond Utilities Project Coordinator, during construction to confirm that the drawings are accurately maintained. At the completion of the project, the Inspector shall review the Record Drawings. The Inspector shall note any errors or

omissions observed on the drawings and report these immediately to the Engineer and Richmond Utilities.

RECORDS AND REPORTS

Introduction

Construction records and reports provide documentation of the data, activities, transactions, and verbal communications relating to the project. The importance of good construction records and reports cannot be overemphasized. During execution of the project, records and reports enable other personnel who are not directly involved with its construction to monitor and assess the work as it progresses. Following completion of construction, the records and report provide permanent documentation of the work as performed. This information may be used for payment purposes, resolution of disputes, and re-creation of the job history.

Reporting of the work should be secondary to the actual observation of the construction process. While it is essential that the Inspector not allow report writing to interfere with the prime objective of his job, records and reports must be considered as an integral part of the inspection process. Records and reports must be accurate and shall be written promptly while job occurrences are still easily recalled by the Inspector.

All records and reports must be completed in a neat and organized manner. The inspector should remember that his/hers reports and records will be viewed by others, and that they may be presented in a court of law as evidence relative of the project.

Inspection Report Forms

The Daily Field Report is used as a permanent record of the job history, and to provide a means for re-creating job progress on a day-to-day basis. Any job-related items which the Inspector feels is relatively important shall be included in the Daily Field Report. An example of the completed Daily Field Report is shown in Figure 1.

All Daily Field Reports must be completed daily, preferably as soon as possible after specific events occur. The Inspector will submit Daily Reports to the Engineer and Richmond Utilities bi-weekly or as specified by Richmond Utilities at the pre-construction meeting.

Daily Field Reports shall have, as a minimum, the following information:

1. Site Specific Information - The project name, date, Inspectors time of arrival and departure, Contractor's representatives, equipment on site, and visitors on site.

2. Weather - The daily temperature, sky conditions, presence of rain, snow, or wind.

3. Daily Work Completed - Summarize the construction activities of the day. List as much detail as possible such as: (began installing 12" pvc sanitary sewer pipe at Manhole station 5+00 ended at approximate station 11+25).

4. Unusual Occurrences - List any adverse conditions encountered such as soft soil conditions, unexpected bedrock, and presence of ground water, utility conflicts, equipment breakdowns, and unsafe conditions. Report any delays, and identify causes for the delays. Discuss any controversial matters, noting any deficiencies or violations by the Contractor with respect to the drawings and specifications, such as: (the Contractor indicated that he has no intentions of providing the required 6" bedding beneath the pipe due to rock. The Inspector pointed out to the Contractor that he has no choice per the specifications must have 6" bedding below pipe)... Also, describe any corrective measures undertaken by the contractor.

5. Instructions Issued and Received - Any instructions pertaining to the project that issued or received by the Inspector shall be recorded. The recipient or source of the instructions must be identified.

SANITARY SEWER TESTING

1. Low-Pressure Air Test Report - Low- pressure air test shall be performed on flexible and rigid-pipe gravity sanitary sewer as described in accordance with Richmond Utilities Sanitary and Water Line Facilities Specifications and Details Manual. An example of a completed Low-Pressure Air Test Report is shown in Figure 2. In the report, the type, size, and location of the pipe tested are identified. The time required for completion of the air test varies with the pipe size and in accordance with applicable specification. In addition, the Low-Pressure Air Test Report is used to record the results of deflection tests. Following the completion of either test, the results of the test noted by writing either “passed” or “failed” on the appropriate line. Since low-pressure air test and deflection test of sewer lines are often conducted on separate days, the date of a particular test shall be properly noted. If an air or deflection test should fail, then the passing retest of that pipe section must be performed and documented. The Low-Pressure Air Test Report shall be submitted to the Engineer and Richmond Utilities, as an attachment to the Daily Report.

2. Deflection Test Report – The deflection test shall be performed on all flexible gravity sanitary sewer pipe in accordance with Richmond Utilities Sanitary and Water Line Specifications and Detail Manual Section 2700. The test shall be performed 30 days from the time of installation. The test results are to be noted on the Low-Pressure Air Test Report.

3. Sewer Infiltration/Exfiltration Report - Infiltration and infiltration test are used to assess the leakage potential of installed sanitary sewers. These test shall be conducted in accordance with ASTM C 969 and the RU Sanitary Sewer and Water Line Facilities Specifications and Detail Manual Section 2700.

When computing the allowable leakage, the pipe diameter must be expressed in inches and the pipe length must be expressed in feet.
The results of the test are determined by measuring the total leakage which occurs during the test. During infiltration testing, the flow may be measured by utilizing a flow measuring device such as a flow meter or V-notch weir, or by directing the inflow into a container of known volume during exfiltration testing, the total leakage which occurs during the test is generally determined by measuring the decrease in height of the water in the upstream manhole. If this method is utilized, the total leakage of the test (TLT) may be determined by using the formula included on the report. When using this formula, the decrease in the water level in the manhole and the radius of the manhole must be expressed in feet. It should be noted that this method of measuring the total leakage will not be valid if the level of water in the manhole drops below the crown of the sewer pipe. If this occurs, the total leakage for the test should be determined by measuring the quantity of the water required to raise the water level in the manhole to its original position.

4. Manhole Vacuum Test Report - Vacuum test shall be performed on all sanitary manholes in accordance to the Sanitary Sewer and Water Line Facilities Specifications and Details Manual. An example of a completed Manhole Vacuum Test Report is shown in Figure 3. In the report, the depth, diameter, location, and required test time for the manhole are noted.

The minimum test time required for the completion of the vacuum test varies with manhole depth and diameter. Minimum test times are tabulated in ASTM C 1244 and on the report form. Following the completion of a test, the results are noted by writing either “passed” or “failed” on the appropriate line. If a vacuum test should fail, then a passing retest of the manhole must be performed and documented. The Manhole Vacuum Test Report shall be submitted to the Engineer and Richmond Utilities as an attachment to the Daily Field Report.

5. Pump Station Equipment Check List - The Pump Station Equipment Check List shall be completed after the pump station is constructed and prior to the initial start-up of the station by the Engineer and witnessed by Richmond Utilities. An example of a completed Pump Station Equipment Check List is shown in Figure 4. The inspector shall carefully check the pump station to verify that pertinent items included on the form have been installed and are working. Any deviation from the Contract Documents shall be listed under remarks. Following completion of the check list the form shall be submitted to the Engineer and Richmond Utilities as an attachment to the Daily Field Report.

6. Pump Station Start-Up Report - Prior to final acceptance of a pump station by Richmond Utilities, a Pump Station Start-Up Report must be completed by the Engineer. The purpose of the Pump Station Start-Up Report is to verify that all components of the pump stations are working properly. All information on the report must be completed by the Engineer including all pertinent data and shall be forwarded to the Project Coordinator. Any components which are found to not function properly shall be repaired or replaced as soon as possible, and a new Pump Station Start-Up Report shall be submitted.

7. Force Main Hydrostatic Test Report - Hydrostatic testing is required on all force mains and shall be done in accordance to Richmond Utilities Sanitary & Water Line Facilities Specifications. An example of a completed Force Main Hydrostatic Test Report is shown in Figure 5. In the report, all pertinent information relative to the force main shall be entered on the lines provided. The force mains should be filled with water and subjected to an internal pressure of a minimum 150 psi or up to the maximum pressure rating of the pipe, measuring at the lowest possible elevation at the end of the line. The testing pressure should be held for a period of 4 hours. Evaluation of the final results is to be noted by writing "passed" or "failed" on the appropriate line. The Force Main Hydrostatic Test Report shall be submitted to the Engineer and to Richmond Utilities as an attachment to the Daily Field Report.

WATER MAIN TESTING

1. Hydrostatic Test Report – The hydrostatic test shall be done in accordance to the Richmond Utilities Sanitary Sewer & Water Line Facilities Specifications Manual - Section 02610. An example of a completed Water Hydrostatic Pressure form is shown in Figure 5. In the report all pertinent information relative to the water main shall be entered on the lines provided. This test shall be witnessed by the assigned Project Inspector as well as the Richmond Utilities Project Coordinator and /or Richmond Utilities Water Staff.

2. Disinfection Test Report – The disinfections test shall be done in accordance to the Richmond Utilities Sanitary Sewer & Water Line Facilities Specifications Manual - Section 02610. An example of a completed Water Line Disinfection form is shown in Figure 6. In the report all pertinent information relative to the water main shall be entered on the lines provided. This test shall be witnessed by the assigned Project Inspector as well as the Richmond Utilities Project Coordinator and/or Richmond Utilities Water Staff.

3. Initial Water Punch List Report - After the water line has passed all water test, the Project Inspector with the Project Coordinator and appropriate Richmond Utilities Staff, shall conduct an initial punch list in accordance to the Richmond Utilities Procedure Manual. An example of a completed Initial Punch List form is shown in Figure 7. In the report all pertinent information relative to the water main shall be entered on the lines provided.

CONSTRUCTION PHOTOGRAPHS

Construction photographs shall be taken with a digital camera having an automatic date recording function.

The importance of routinely taking and logging construction photographs can not be over emphasized. These photographs are important for documenting construction activities, site conditions, and weather conditions. The Inspector shall make a habit of photographing all aspects of construction and not just those activities that may present potential conflict. The Inspector

shall prepare a description log of each photograph when the photograph is taken.
This description shall include measurements to valves, fittings and appurtenances including two (2) point measurements to locate the top of valve box at surface grade and depth from surface to top of valve or appurtenance.

The log shall specifically identify the subject of the photograph and its location. The photographs should also be properly labeled to include as applicable station numbers, viewing observation point (North, South, East and West) Photographs and logs shall be submitted to the Engineer as soon as practicable.

Photographs along with written descriptions are to be bound in 3 ring binder and identified by Project name and/or contract identification number. Digital photographs and log booklet are to be submitted to the Richmond Utilities Board at the same time of the Record Drawing (As-Built) submittal.

RECORD DRAWINGS (AS-BUILTS)

The Record Drawings represent the final record of the as-constructed alignment, layout, and details of the facility. These drawings will be relied upon by Richmond Utilities for future expansion and maintenance planning. The Record Drawings are a dynamic set of plans that are continually updated by the Engineer during construction to reflect minor design changes, deviations from the original plans, and the location of previously unknown utilities and site conditions.

Considering the Inspector's knowledge of the site and construction activities, it imperative that he/she routinely review the Record Drawings during construction and at the completion of the project. The Inspector's independent review will reduce error and omissions present in the final documents.

The Developers Engineer and Inspector will also be responsible to insure that the Final Digital Record Drawings will properly geo-reference onto the Richmond Utilities Geographic Information System (GIS) Base Map.

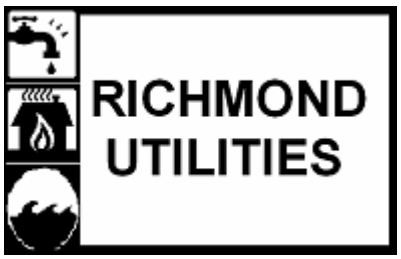

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FIGURE 1

DAILY FIELD REPORT

Project_____ Date_____
Locations_____ Inspector_____
Weather_____Temp._____ Engineer_____
Developer_____ Contractor_____

THE FOLLOWING WAS NOTED TODAY:

_____
_____
_____
_____
_____
_____
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_____
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Copies To:_____ Signed:_____
_____
Attachments_____
_____
_____

FIGURE 2-A

LOW-PRESSURE AIR TEST REPORT

***Project*____**
Location____
Project/Contract No.__________________________________

***Date*____**
Inspector____
Contractor____

Upstream MH Sta. #_______ Downstream MH Sta. #_______
Diameter of Pipe___________
Length____________________
Initial Pressure Raised To (psig)_________________________
Time Allowed to Stabilize ______________________________
Start Test Pressure (psig) _______________________________
Stop Test Pressure (psig) ________________________________
Elapsed Time (min: sec)_________________________________
PASS OR FAIL _______________________________________
DEFLECTION TEST__________________________________

Upstream MH Sta. #_______ Downstream MH Sta. #_______
Diameter of Pipe___________
Length____________________
Initial Pressure Raised To (psig)_________________________
Time Allowed to Stabilize ______________________________
Start Test Pressure (psig) _______________________________
Stop Test Pressure (psig) ________________________________
Elapsed Time (min: sec)_________________________________
PASS OR FAIL _______________________________________
DEFLECTION TEST__________________________________

Upstream MH Sta. #_______ Downstream MH Sta. #_______
Diameter of Pipe___________
Length____________________
Initial Pressure Raised To (psig)_________________________
Time Allowed to Stabilize ______________________________
Start Test Pressure (psig) _______________________________
Stop Test Pressure (psig) ________________________________
Elapsed Time (min: sec)_________________________________
PASS OR FAIL _______________________________________
DEFLECTION TEST__________________________________

FIGURE 2-B

INFILTRATION/EXFILTRATION

TEST REPORT

Project_____
Date_____

Location_____ Inspector _____
Project_____ Contractor _____

Infiltration Test
Exfiltration Test

1. TEST INFORMATION:

Pipe Description _____
Pipe Diameter (A) _____
Pipe Length (B) _____
Length of Test (C) _____

2. ALLOWABLE LEAKAGE: (FORCE MAIN)

Total Allowable Leakage (TAL) = The line will not be accepted until the leakage shall prove to be less than 10 gallons per inch diameter per 24 hours per Richmond Utilities Sanitary Sewer and Water Line Facilities Specifications and Detail Manual Section 2610.

3. The Total Leakage for test (TLT) for the exfiltration test may be determined by measuring the decrease in the height of the water in the manhole. If this method utilized, the following formula may be used to calculate the TLT in terms of gallons:

Diameter of Manhole (D) _____ (feet)

Decrease in Manhole Water Level (E) _____(feet)

TLT = E x 3.14 x (D – 2)__ x 7.48

= _____ x 3.14 x (_____ - 2)___ x 7.48
= _____ (gallons)

FINAL RESULTS _____

Figure 3

Manhole Vacuum Test Form

Project_____ Date_____
Location_____ Inspector _____
Contractor_____ Weather_____Temp._____

MANHOLE INFORMATION

Manhole Station_____
Manhole Diameter_____ feet
Manhole Depth _____ feet
Minimum Test Time_____ seconds (see table)

TEST RESULTS

Test Starting Time_____ Gauge Reading _____(in.Hg)
Test Ending Time_____ Gauge Reading _____(in. Hg)
Final Result _____

Minimum Test Time for Various Manhole Diameters (Seconds)
(from ASTM C1244)

Manhole Depth	**Manhole Diameter (ft)**				
(ft)	4.0	4.5	5.0	5.5	6.0
	Time (seconds)				
8	20	23	26	29	33
10	25	29	33	36	41
12	30	35	39	43	49
14	35	41	46	51	57
16	40	46	52	58	67
18	45	52	59	65	73
20	50	53	65	72	81
22	55	64	72	79	89
24	59	64	78	87	97
26	64	75	85	94	105
28	69	81	91	101	113

FIGURE 4

PUMP STATION EQUIPMENT
CHECK LIST

Project_____ Date_____

Location_____ Inspector_____

Project/Contract_____ Contractor_____

1. Review Specifications_____
2. Copies of O & M Manuals_____
3. Access Road Paved pr Stoned_____
4. Grade Work & Landscape_____

VALVE PIT

1. Vent Painted_____
2. Drain Check Valve_____
3. Check Valve Spring_____
4. Hatch Hole Arm & Spring_____
5. Air Relief Valve _____
6. Pressure_____
7. Gate Valve Rising Stem (handwheel)_____
8. Clean_____

PUMP STATION

1. Vent Painted_____
2. Hatch Hole Arm & Spring_____
3. Pump Cable S. S._____
4. Pump Lift Cable S. S._____
5. Pipe_____
6. Bolts S. S._____
7. Rail Supports S. S._____
8. Anchor Bolts S. S._____

ELECTRICAL

1. Light_____
2. Rigid Conduit_____

3. Main Disconnect_____
4. Single Phase_____
5. Telemetry Panel_____
6. Three Phase_____

CONTROL CABINET

1. Stand S. S._____
2. Telemetry S. S. _____
3. Transformer Outdoor Use_____
4. Vault Door Closure Handle_____

CHECK FOR:

1. Pump Alignment of Guide Rails_____
2. Easy Pump Removal Thru Hatch_____
3. Pump Off_____
4. Pump #1 On_____
5. Pump #2 On_____
6. High Wet Well Level_____
7. Power Cable Loop Length (2 ft. Min.)_____
8. Rigid Conduit_____
9. Seal Cable into Cabinet_____
10. Review Plan and Cab. Instrumentation for Compliance_____

REMARKS:_____

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FIGURE 5

PRESSURE TEST ON WATER MAIN

PROJECT:

Inspect construction site and Check the Following:

1. Bends, caps, fire hydrants, plugs and valves are to be secured with concrete thrust block kickers.
2. Pipe should be covered with proper backfill material to the proper depth.
3. All valves are to be open from pressure gauge to the end of the pipe being tested, except for tapping valve.

	DATE	TIME(FROM-TO)	PRESSURE	INITIAL RU CONTRACTOR
Start Pressure test:	_____	_____	_____	_____
PRESSURE CHECKS:	_____	_____	_____	_____
PRESSURE CHECKS:	_____	_____	_____	_____
PRESSURE CHECKS:	_____	_____	_____	_____
END PRESSURE TEST:	_____	_____	_____	_____

Pressure differential over 4 hour period:

Starting Pressure _____psi - End pressure _____psi = ____psi

Pressure Test: Circle One Pass Fail

_____
RICHMOND UTILITIES REPRESENTATIVE

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FIGURE 6

Disinfection of Water Main
Chlorine Residuals
Bacteriological Analysis

PROJECT:

PROCEDURE: Water main is to be flushed after pressure test until water is clear and chlorine residual holds at system strength. Fill water main with disinfectant solution to 50 ppm Cl_2 residual and let set for 24 hours. After 24 hour period Cl_2 residual must not fall below 25 ppm. (50 ppm – 24 hours – 25 ppm)

Flush entire water main until chlorine residual is equal to system strength.

Valve off to isolate water line until certified lab notifies Richmond Utilities that bacteriological sample results are negative,

	DATE	TIME	Cl Res.	Initials RU CONTRACTOR
Start test:	_____	_____	_____	_____
End Test:	_____	_____	_____	_____
Flush Main:	_____	_____	_____	_____
Bac-T Sample:	_____	_____	_____	_____
Bac-T Results:	_____	_____	_____	_____

Disinfectant Test: Circle One Pass _____ Fail _____

_____
RICHMOND UTILITIES REPRESENTATIVE

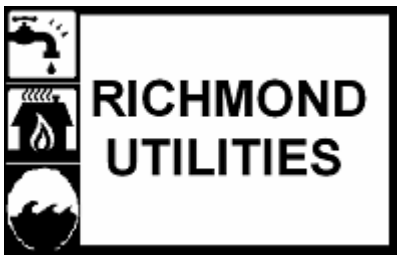

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FIGURE 7

PROJECT:_____

DATE:_____

CONTRACTOR:_____ RU RPRESENTATIVE_____

CONTRACTOR REP:_____

INSPECTION PUNCH LIST

CHECK ONE OF THE FOLLOWING:

_____ Initial Punch List – Check materials, location, installation, function and operations of the valves, fire hydrants, and meters.

_____ Follow up Punch List – Contractor will need to schedule with Richmond Utilities after curbs and streets are installed.

____ Final Punch List.

____ Completion of Punch List.

CONTRACTOR'S "AS BUILT" DRAWINGS _____ RECEIVED _____ INCOMPLETE

VALVES:

INLINE: # _____

OPERABLE _____

INOPERABLE _____

METER SETS:

_____

OPERABLE_____

FIRE HYDRANTS:

_____

OPERABLE_____

VALVES TO HYDRANTS_____

FIRE FLOW TEST DATA:

STATIC_____PSI

FLOW_____PSI _____ GPM

RESIDUAL_____PSI

COMMENTS:

Richmond Utilities
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Fire Hydrant Flow Test
Operator:_____ Project/Subd:_____
Date: _____ Time: _____

Fire Hydrant Static, Residual and Flow Pressures:

I. Prior to flowing fire hydrant review: safety procedures; determine procedures to ensure system water quality; maintain above 20 psi residual pressure in system while flowing fire hydrants; and provide protection from possible property damage. Notify customers of potential discoloration problems. Secure fire hydrant caps prior to turning on hydrants. Direct discharge waters to storm sewers and away from traffic, buildings, lawns, gardens, etc. Use 2 ½ inch nozzle on fire hydrant to measure hydrant flows.

II. Operate isolation valve and record number of turns to close/open: _____ turns replenish oil in stem well and grease cap threads _____.

III. Fire Hydrant Locations:

Fire Hydrant #1 location (Static/Residual Pressure Gauge Hydrant)
_____

Fire Hydrant #2 location (Flow Hydrant and measure flow using pitot gauge)
_____

Drawing showing fire hydrant locations:

IV. Fire Hydrants Test Results
Fire Hydrant #1: Static Pressure: _____ Residual Pressure: ____ PSI

Fire Hydrant #2: Flow Pressure: _____ Flow:_____ GPM

Signature: _____ Date: _____