Request for Proposal
SSES Phase 3 Addendum No. 2 to
RFP No. 179821.78.0021
June 10, 2015

The following information encompasses Addendum No.2 for the above referenced RFP. Bidders shall fully consider and acknowledge this Addendum in the preparation and submittal of its formal Proposal. Failure to do so may result in the rejection of the Proposal.

Section 1 – Additional Bidder Questions

Section 2 – Updates to the RFP

All other conditions and requirements remain unchanged.

Section 1 – Additional Bidder Questions

Q1: In Section 00001 – Manhole GPS & MACP Inspection – Part 3.01, Section C, Page 000001-6; it states, "Digital camera inspections of manholes shall be completed in conjunction with Level 2 manhole inspections of defects and include each sewer pipe connection in the manhole. The photo record of the inspection shall include a photo record of the connecting pipes in each manhole."

Is this a photo of the pipe at the connection point with the manhole that shows the pipe seal, or is this a photo that is taken up the pipe that show the structural integrity of the pipe?

SARP10: Using a pole camera, the ideal pipe connection photo is a center of the pipe photo aimed directly down the pipe and also showing where the pipe meets the manhole wall. (See example attached below)

Q2: In Section 00003 – Closed Circuit Television Inspection of Sewer Mains & Connections – Part 2.02, Section B-1 a., Page 00003-3, it states; "NASSCO PACP protocols Version 6.0.1 shall be used for capturing and recording the observations. Audio commentary made during the inspection and captured on the digital video shall correspond with the PACP observation log."

Per NASSCO, audio commentary is optional. Is this the case for this protocol, or is it mandatory?

SARP10: Audio commentary is recommended but not required.

Q3: In Section 00003 – Closed Circuit Television Inspection of Sewer Mains & Connections – Part 2.02, Section C-1 e., Page 000003-4, it states; "Document header and observations shall be in accordance with PACP V.6.0.1 protocols."

Does the mandatory header field match NASSCO PACP V.6.0.1 exactly? Or, are there additional header fields that need to be filled in?

SARP10: In addition to the mandatory fields all of the optional fields listed in NASSCO PACP V.6.0.1. are program required. There are a few additional fields that are also program required.

Section 2 – Updates to the RFP

CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS
SECTION 00003 - CLOSED CIRCUIT TELEVISION INSPECTION OF SEWER MAINS & CONNECTIONS

PART 1 – SCOPE

1.01 This Work will consist of cleaning and Pipeline Assessment Certification Program (PACP) internal closed circuit television (CCTV) surveys to digitally inspect and record conditions of existing sanitary sewer mains and connections. Sewer pipes and connections to be inspected are located in both improved streets, arterial and primary roads, backyards and unimproved easements.

1.02 The Work covered by this section includes furnishing all labor, competent PACP certified technicians, equipment, tools, accessories, and materials required to clean and inspect the designated sanitary sewer lines.

1.03 PACP compliant inspections, logs, data, and photos shall be delivered to the Program Manager (from hereon Program Manager shall be interpreted as "Program Manager or his designee") on external hard drive(s) which will become property of the Program Manager. Data files shall be formatted to facilitate upload into a PACP compliant Exchange database or internet uploads formats to an FTP site approved by the Program Manager.

PART 2 – MATERIALS & EQUIPMENT

2.01 MATERIALS

A. Submittals

1. Unless otherwise specified all sample submittals shall be delivered to the Program Manager within two weeks of the NTP.
2. Traffic Control Plan shall be submitted to the Program Manager, including the following items:
   a. Outline of permit acquisition procedure for lane closures.
   b. Methods for proper signing and barricades, which comply with City of Memphis requirements.
   c. Major streets (e.g. Shelby County Principal Arterial & Minor Arterial) requiring a City approved permit if taking a lane for mobile operations, secured through Traffic Control Plan submittal to the City and signed by a TN P.E. The City requires two-week lead time for permit processing.
      i. The Contractor will be required to deliver a sample primary/arterial road Traffic Control Plan for review by the City.
      ii. If the City determines that the nature of the work operation or the type of road in which the Contractor is working requires a permit, the Contractor will be required to modify the sample Traffic Control Plan to obtain a permit from the City.

d. For everywhere else where a permit is not required, the Contractor shall develop, provide, and implement a traffic control plan for all mobile operations in accordance with standard MUTCD specifications.
e. The Contractor is also responsible for acquiring all necessary disposal and/or landfill site permits as required to perform this work.
f. Railroad Rights of Way: The Contractor shall notify the Program Manager when work or access to manholes and sanitary sewers lie within the 25 feet railroad easement as measured by 25 feet outside the nearest rail of the tracks. To access sewer facilities within the 25 feet of the railroad right of way the Contractor shall contact the Program Manager 48 hours in advance who will alert the City's Zone Construction Inspector to coordinate individual railroad direction and guidance.

3. Site Contractor emergency phone numbers.
4. Schedules of work on a weekly basis that will be delivered no later than 2:00 PM on Thursday for the week following with daily AM email updates of approximate crew locations each day.
   a. Weekly schedule format shall contain the following elements:
      i. Map format.
      ii. Sufficient streets labeled and identified at a scale to provide clarity.
      iii. Nature and type of crew location by map area.
5. Permit required confined space entry plans in compliance with the Loss Control Manual.
6. Copies of National Association of Sewer Service Companies (NASSCO) certification for all field staff conducting PACP inspections.
7. Sample of PACP compliant television survey log in MS Access format.
8. Sample of PACP compliant video inspection in MP-4 (Web optimized) format.
9. Cleaning and CCTV vehicle, equipment, and cleaning supplies list.
10. Disposal site(s) and appropriate landfill permits for appropriate disposal of all waste materials removed from the sewer during the light and heavy cleaning operations.

2.02 EQUIPMENT

A. General

1. All equipment used for PACP compliant CCTV sewer segment inspections of existing sanitary sewer mains and connections shall be specifically designed and manufactured for the purpose intended under this Contract. The software and hardware for the electronic

capture of the inspection defects and recorded observations must be Version 6.0.1 NASSCO PACP compliant.

2. The Contractor shall submit an equipment list to the Program Manager for approval before the commencement of the Work and shall certify that back-up equipment is available and can be delivered to the worksite within 72 hours.
3. The Contractor shall provide equipment to perform inspections of sewer mains located in streets, street rights-of-way, backyards, easements and rights-of way that are off-road.
   a. Including but not limited to portable CCTV equipment, vehicles capable of transporting TV equipment and accessing remote easements, and adequate cleaning equipment rights of way or easement applications.

B. PACP Compliant Software & Data logger Requirements

1. Data logger
   a. Internal inspection logs created and captured electronically during the television inspection through the use of commercially available electronic data loggers in the truck are required. NASSCO PACP protocols Version 6.0.1 shall be used for capturing and recording the observations. Audio commentary made during the inspection and captured on the digital video shall correspond with the PACP observations on the log.
   b. The data logger equipment and software shall allow the Program Manager access directly to the captured electronic data and provide for a non-proprietary export of the data into MS ACCESS databases in accordance with PACP standards for standalone database review.
2. Software must be compliant with the NASSCO PACP V.6.0.1 standards. Follow PACP protocol for recording of observations and defects for sewer mains.
   a. All software shall be capable of providing complete survey reports in compliance with PACP, and the software shall be the V.6.0.1 of the PACP compliant software.
   b. The Program Manager has no intent to specify which software the Contractor shall use, but requires the software and the submitted database to be fully compliant with PACP V.6.0.1 and capable of being exported to ACCESS databases. No payment will be rendered for improperly formatted data.
   c. Software and data logger must be capable of capturing sewer main and sewer lateral observations by PACP descriptions, record travel footage along pipeline, and video time stamp the recorded observations to support hyper linking from the digital record to the event point or location within the digital inspection record. The

same requirements apply to still photo images (if provided) which shall follow PACP guidelines and be hyperlinked to the inspection log.

C. Sewer Main CCTV

1. Sewer Main Digital Color Video Camera
   a. All cameras used shall be digital format color CCTV units specifically designed and constructed for use in sewer pipe inspection work. The cameras shall be operable in 100 percent humidity conditions. The camera shall have a high-resolution, 360-degree pan and tilt or rotating head with a wide viewing angle lens and either automatic or remote focus and iris controls. Camera lighting shall be sufficient for use with digital color inspection cameras and for the manhole and pipe diameters identified in the contract.
      i. Camera, Television Monitor, and Other Components shall be capable of producing a high resolution color digital inspection record.
      ii. Video file to be in MP-4 (Web optimized) format
   b. In all cases, the complete digital inspection system (camera, lens, lighting, cables, monitors, and recorders) shall be capable of providing a digital picture and digital video quality acceptable to the Program Manager. Inadequate lighting, image distortions, blurry or murky images, and dirty lenses will be a cause for rejection. No payment will be made for unsatisfactory inspections and the Contractor shall perform work until deliverable is of acceptable quality. Digital video cameras/digital recorders not specifically intended for use for internal television inspection of manholes and sewer lines shall not be permitted.
   c. Pan and tilt type camera, capable of turning at right angles to pipe's axis over an entire pipe wall perimeter shall be used.
      i. The camera lens shall be capable of self-righting itself after a lateral view or connection view with a return view down the pipe with a "home" capability for the lens.
   d. Lighting shall be suitable to allow clear picture of entire inner pipe wall extending at least 10 feet in front, including black High Density Polyethylene (HDPE) pipe.
   e. Document header and observations shall be in accordance with PACP V.6.0.1 protocols.

D. Cleaning Equipment

1. Hydraulic sewer pipe cleaners or combination hydraulic/vacuum cleaners shall be specifically designed and constructed for such cleaning.
2. Mechanical sewer pipe cleaners shall be specifically designed and constructed for such cleaning.
3. The Contractor shall possess equipment capable of cleaning hydraulically or mechanically a minimum of 1,000 linear feet of pipe from one direction and have a minimum 1,000 linear feet of hose or cable on-site during the cleaning execution.
4. Hydraulic sewer pipe cleaners shall be specifically designed and constructed for such cleaning. The sewer cleaner shall have a minimum usable water capacity of 600 gallons and a pump capable of delivering at least 30 gallons per minute at 1,500 psi at the nozzle.
   a. The hydraulic cleaning equipment shall have multiple hydraulic cleaner hose nozzles for a variety of sewer cleaning conditions, including grease, roots, debris and granular materials.
   b. Vacuum equipment shall be capable of lifting debris removed from the segment from the downstream manhole.
5. Mechanical sewer pipe cleaners (cable machines with buckets, brushes, swabs, root cutters, and power rodders with similar capability) shall be capable of controlled forward and reverse travel through the sewers without inflicting damage to the existing pipe in removing rocks, grit and other heavy debris and roots.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 CCTV Inspection of Sewer Mains

A. Cleaning

Sewer pipe cleaners or combination hydraulic-vacuum cleaners must accompany CCTV units at all times. Ideally, sewers lines are to be cleaned and then followed immediately by CCTV inspection. All sewers must be cleaned in advance of CCTV during the same calendar day they are inspected.

1. Light Cleaning
   a. Before CCTV work, the Contractor shall light clean the sewer line from manhole to manhole, from upstream to downstream direction unless an obstruction is encountered, one sewer section at a time and performed as efficiently as possible at the Contractor's discretion.
   b. Materials shall not be passed from one sewer segment to another but must be trapped and removed from each sewer segment prior to CCTV inspection.
2. Heavy Cleaning
   a. If a camera is inserted and additional debris or impediments to inspection are observed following the required light cleaning, heavy cleaning shall be approved by the Program Manager. Sections of pipe containing significant roots, large areas of debris, and/or several inches of depth of sands and gravels that will require the use of additional hydraulic nozzles, cable/bucket machine, power rodders and root cutters is considered heavy cleaning.
   b. Heavy cleaning will be proposed by the Contractor and approved by the Program Manager. The Contractor must obtain prior approval for heavy cleaning in each sewer segment in order to receive payment for heavy cleaning.
3. Cleaning Execution
   a. No roots, grease or debris from light or heavy cleaning shall be passed from sewer segment to sewer segment during the cleaning operation. All debris flushed from the sewer must be collected, captured, and removed from the sewer at the downstream manhole.
   b. Roots shall be removed in the sections where root intrusion is a problem. Special precautions shall be exercised during the cleaning operation to assure complete removal of visible roots from the joint area and so as not to incur further damage to the pipe. Any visible roots that may impact rehabilitation efforts shall be removed. Fine roots are allowed if the Contractor made a heavy cleaning attempt to remove roots with proper root removal means. Procedures may include the use of mechanical devices such as rodding machines, expanding root cutters and porcupines, and hydraulic procedures such as high-pressure jet cleaners.
   c. The Contractor is responsible for safe, responsible and legal handling and disposal of all material and debris removed from the sewers. The Contractor is responsible for all permits and landfill fees associated with the disposal of debris collected and removed from the sewer.

d. The Contractor shall provide a dated manifest of the volume or weight of the dewatered sewer cleaning loads taken and dumped at the permitted dump site selected by the Contractor. Each waste load manifest shall be associated with a list of corresponding sewer segments from where the waste originated.

B. Sewer Flow Levels During Inspection Operations

1. Maintain low sewer flow during inspection by using sandbags or flow-through plugs or by inspecting during low flow times of day, evening, or early morning hours while camera is moving and recording observations in the sewer segment. Any items used to restrict flow shall be removed immediately after intended use.
   a. Flow-through Plugs: If used, secure the plugs so as to remain in place during inspection. Use a fail-safe device at the downstream pipe connection to ensure the plug is not lost in the downstream sewer segment if it becomes dislodged from the upstream pipe connection.
   b. Conduct all cleaning and CCTV operations to prevent building backups and sewer overflows.
   c. Contractor shall be responsible for cleanup, repair, fines, property damage costs, and claims for any sewage backup, spillage or sanitary sewer overflow during or as a result of the cleaning and inspection operations.
2. Allowable Depth of Flow For Inspection Operations
   a. For effective inspection, all flow shall be minimized in the segment being inspected. However, the depth of flow at the upstream manhole of the interceptor section being worked shall be within the specified limits provided herein.
3. Maximum Allowable Depth of Flow for CCTV Inspection
   a. 6 - 10 inch diameter Pipe - 20% of pipe diameter
   b. 12 - 18 inch diameter Pipe - 25% of pipe diameter
   c. 24-inch diameter and Larger Pipe - 30% of pipe diameter
   d. Exceptions to these guidelines shall result in rejection, and non-payment, of the CCTV inspection unless approved in advance by the Program Manager.

C. Camera Operations

1. Using the pan/tilt feature, pan the interior of the manhole for record purposes in accordance with V.6.0.1 PACP protocols and begin and terminate the inspection in the starting and ending manholes.
   a. Capture the inside of manhole walls, manhole channel, and pipe connection to wall at both upstream and downstream manhole and

lateral connections using the digital mainline sewer camera and the pan/tilt feature.

2. Place the camera at center of manhole and commence video before entering pipe.
   a. Start footage counter at manhole wall/pipe connection or at a short pre-measured distance down the pipe for the sewer segment inspection.
3. Connections: The digital camera shall be used to look at connections and up laterals from the connection in the main sewer pipe being inspected. The camera shall pause, pan, and record all connections. Conditions noted in these sidelines and laterals shall be noted on the inspection logs.
4. Mainline camera operations:
   a. Move through line at speed no greater than 30 feet per minute stopping for minimum 10 seconds to record lateral connections, mainline connections, defects, and features and points of interest.
   b. Do not float camera.
   c. Maintain technical quality, sharp focus, and distortion free picture with the camera lens centered in the pipe for the different diameters inspected.
      i. Eliminate steam in line for duration of inspection.
      ii. Utilize blower as needed to defog sewer line.
   d. Digitally record a complete sewer segment in its entirety with no breaks, “blink-outs,” or interruptions from manhole to manhole according to PACP V.6.0.1 formats.
   e. Pan, tilt, and rotate as necessary to best view and evaluate lateral connections, pipe defects, features, obstructions, and points of interest.
   f. Use power winches, powered rewinds, self-propelled tractors, or other devices that do not obstruct camera view or interfere with proper documentation of sewer conditions to move camera through sewer.
   i. Whenever non-remote powered and controlled winches are used, set up telephones or other suitable means of communication between manholes to insure good communication.
   g. Use hydraulic jet nozzle pressure and flow to remove standing water from depressions or sags in the sewer, if necessary, for complete inspection of the sag portion of the sewer segment.

h. Measurement for location of defects and service laterals:
    i. At ground level by means of Program Manager-approved footage counter or metering device.
    ii. Electronic display measurement meters: Accurate to PACP standards over length of section being televised.
    iii. Do not pull unnecessary length of slack camera cable if it impacts the footage counter.
i. Stop camera at service connections and inspect lateral with pan and tilt camera.
    i. Identify building connection in PACP compliant terms as active, capped, or abandoned.
    ii. If no wastewater flows are being discharged from building, consider steady, clear observed flow as infiltration/inflow.
j. Identification of defects
    i. If roots, sludge, or sediment material impedes inspection after the light cleaning, withdraw camera and perform heavy cleaning at the direction of the Program Manager.
    ii. Upon completion of heavy cleaning operation, resume internal inspection.
    iii. Furnish media confirmation for heavy cleaning (more than three passes with jet cleaner) to Program Manager.
    iv. If protruding tap impedes inspection trim protruding tap to 1/2 inch.
k. If obstructions are not passable and cannot be removed by sewer cleaning, withdraw CCTV equipment and perform a reverse inspection from opposite end of the sewer segment in accordance with PACP protocols.
    i. Contractor shall be responsible for costs associated for reverse set-ups when an obstruction is encountered that cannot be passed.
    ii. Contractor shall be responsible for all judgments and impacts as to whether an obstruction in the sewer main can be passed. Costs involved in extracting a stuck camera in the sewer main will be borne by the Contractor and at no additional cost to the Program Manager.
    i. When additional obstructions are encountered after reversal of equipment and no means are available for passing a second obstruction in order to complete the sewer main inspection, remand the segment inspection to the Program Manager for resolution. The portion of the main inspected will be paid for as prescribed.
l. Undocumented facilities
    i. If undocumented manholes or sewer mains (facilities not on the field updated GIS sewer maps) are encountered during the inspection, the Contractor needs to complete the

documentation requirements per PACP requirements and capture on the video the following:

1. Approximate horizontal distance from the upstream or reference manhole.
2. Approximate depth of the undocumented manhole by turning the pan/tilt camera vertically and estimating the height of the cover from the invert.
3. A provisional manhole asset ID number shall be used by the Contractor by adding a dash and two-character number to the closest upstream manhole ID.

m. Retrieval of Stuck Equipment

The Contractor is responsible for hiring a licensed sub-contractor to retrieve any equipment/foreign objects that get stuck in the sewer system through the execution of the scope of work (fallen cameras, jet nozzles, inflatable plugs, sandbags etc.) at the Contractor's own cost. Such retrieval by an appropriately licensed sub-contractor shall be made within 72 hours to avoid interfering with the City of Memphis sewer system operations. Any and all impacts and related costs due to the Contractor's equipment in the line shall be the responsibility of the Contractor. Contractor shall follow SARP10 sewer point repair specifications outlined in "Section 02540 Sanitary Sewer Point Repairs" and "Section 02950 Removal and Replacement of Pavements and Incidentals" during retrieval of equipment. Also per "00585.2.2 Safety, Health, and Accident Prevention Program", Purchaser must approve sub-tier contractors prior to mobilization to the jobsite.

D. Quality Assurance

1. With each monthly invoice the Contractor shall provide a QA/QC memo documenting that 10% of the previous month's CCTV data has undergone a random, independent review by a PACP certified reviewer using NASSCO standards for Television Inspection of Main Sewer and PACP Quality control as the basis for the QA/QC procedures. The independent reviewer shall be a Tennessee P.E. or is a P.E. in another state and has a Tennessee P.E. license pending. Each line segment which has been randomly reviewed shall be identified in the QA/QC memo as well as any subsequent findings or recommendations. Internal independent QA/QC is acceptable, as long as the person is a Tennessee P.E. or is a P.E. in another state

and has a Tennessee P.E. license pending. Failure to submit the QA/QC memo shall delay payment of the current month's invoice.

2. For all new Contractors and Operators who begin PACP coding, an initial review of CCTV data will consist of reviewing, at a minimum, 20 of the first 100 PACP inspection records submitted. Subsequent reviews will be based on the results of the initial reviews as explained below.
3. Auditing Procedures:
   a. Header information: As explained in the NASSCO PACP Quality Control Standards each audited inspection record is given an accuracy level for the header information and the detailed observation records. It is expected that the accuracy of the header record exceed 90% because the majority of the contents are based upon facts and not subject to operator judgment. To assess the accuracy level of the header, record the number of errors as compared to the total number of header fields using the following formula:

      100% - (error count/total header fields)*100% = Header Accuracy

   b. Detailed Observations: Determining the accuracy level for the detailed observation records is similar to the method for assessing the header record. The main difference being that a defect observation has multiple data entries that must also be counted towards the total number of entry fields. In the event that a defect is not coded all of the required entries for coding the missed defect are counted towards the total error count. The following formula is used to calculate the accuracy level of the detailed observation records:

      100% - (error count/total entries) * 100% = Detail Accuracy

   c. Review Scoring and Results
      i. Satisfactory Review, No changes required. Accuracy Level of 90% or above for both the Header Record and Observation Detail with no major errors or omissions found.
      ii. Unsatisfactory Review (below levels of acceptance) will not be accepted by the Program Manager and will not be considered payable items in the Contractor's Request for Payment.

E. Deliverable Documentation

1. Mainline Sewer.
   a. Submit V.6.0.1 PACP compliant records, logs, and electronic inspection data for sewer line inspection to Program Manager by the close of business on the Monday following a week after data acquisition

b. Monthly QA/QC memo submittal listing which segments have been randomly reviewed, as well as any subsequent findings or recommendations.
c. Digital videos, data, and photos shall be delivered to the Program Manager on external hard drives which will become property of the Program Manager.
d. Data files shall be formatted to facilitate upload into a PACP Exchange Database with the approval of the Program Manager.
e. Inspections displaying poor digital video/audio quality will be rejected. Quality refers to, but is not limited to, grease or debris on lens, camera under water, image too dark or light, image washed-out, distorted image, out of focus images, lines improperly cleaned, and poor/no audio.
    i. Contractor will re-televise rejected inspections and resubmit inspections at no additional cost to the Program Manager.

2. Map changes/undocumented manholes:
    a. For map changes identifying undocumented manholes and network changes which were found as a result of field inspections or observations, a Map Edit Form shall also be prepared and supplied by the Contractor with a drawing or sketch and shall indicate special details, field measurement or distances, or locations about an observed undocumented manhole or a change to the sewer network. The Map Edit Form should also identify buried manholes and siphons that have been encountered.
    b. Contractor shall indicate all buried manholes identified in the field via CCTV using the provided Buried Manhole Form. Any additional manholes that have not been located or verified via CCTV but are impeding the completion of required CCTV work should be designated as unable to locate (UTL) and be included on the form.

F. Easement or Turf Operation

1. The Contractor will restore the work area to its original condition as quickly as possible after the inspection is complete. The Contractor will not be allowed to postpone restoration of the site until the end of the project.

PART 4 –DELIVERABLES

4.01 RECORDS

A. Pipe Cleaning Record

The Contractor shall provide a dated manifest of the volume or weight of the dewatered sewer cleaning loads taken and dumped at the permitted

dump site selected by the Contractor. Each waste load manifest shall be associated with a list of corresponding sewer segments from where the waste originated.

B. Digital Inspection Record

In the digital PACP V.6.0.1 compliant format, the Contractor shall provide the following information:

1. Digital CCTV survey inspection which shall be recorded and shall be continuous as the inspection proceeds through the manholes and sewer pipes. Inspection videos should be delivered in an MP-4(Web optimized) format.
2. Digital Recordings: The digital recording shall document the visual and audio record of the manhole and sewer pipe inspection and shall be the basis of measurement and payment. Digital recording playback shall be at the same speed that it was recorded. Original digital recordings for the Project shall be forwarded to the Program Manager on clearly labeled external hard drive(s) in PACP ACCESS format with final report submittals and shall become the property of the Program Manager. Data for a single facility asset will not be split across multiple hard drives. Digital recordings shall be available to the Program Manager by the close of business on the Monday following a week after data acquisition. File naming must be consistent. Additional instructions, naming conventions, file structures, etc. will be provided after contract award.
    a. Picture Quality: The sewer inspection digital record shall be free of steam, fog, vapor, or other headspace distortion that degrades the quality of the picture from the intended purpose of evaluating the sewer for structural and watertight integrity. If necessary, the Contractor shall provide positive ventilation or other means through the sewer pipe to draw out steam, fog, and vapor that will degrade the recorded image of the pipe.

C. Inspection Documentation Logs

Observations made during television inspection shall be documented in an unmodified PACP compliant manner within an electronic inspection log form, supported by accompanying audio, digital photographs and MP-4 (Web optimized) format recording written to an external hard drive and submitted to the Program Manager. Hard copies of completed inspection log photographs shall be furnished to the Program Manager with invoicing.

D. Electronic & Hard Copy Records

1. Reports:
   The Contractor shall prepare printed inspection log reports for each associated sewer pipes inspected during the actual field inspection activities. These field logs shall then be reviewed by the Contractor's technical staff, along with reviewing the associated digital video record, as a means of ensuring that no defects or entries are omitted or incorrect. Edited field logs shall then be used in the final project reports and submitted in pdf format.

2. Draft Report and Final Report:
   The Draft Final Report will contain electronic and hard copies of each of the PACP CCTV log pipe segment inspection logs. Digital recordings of the inspections written to an external hard drive and the PACP compliant database of the inspections in ACCESS format shall also be submitted in electronic and pdf format.

   Draft Report shall be delivered to the Program Manager within fifteen working days the last or final inspection. The Program Manager will have two workweeks to review and comment. Contractor shall address all comments provided and submit a Final Report within one workweek upon receipt of comments. At the Program Manager's discretion a meeting will be held so the Contractor can explain the processes used to address the comments.

E. Meetings

The Program Team will arrange bi-weekly meetings (every other week) with the contractor to discuss data management and field issues.

F. Quality

Rejection of deliverables will be submitted to the Contractor via the Program Team in a written communication discussing issues that must be addressed. The Contractor will be required to follow up with a response within three business days upon receipt of the written communication. Contractors will have seven (7) calendar days from the rejection notice date to make the necessary corrections and resubmit the data deliverable in its entirety.

PART 5 – MEASUREMENT

5.01 LIGHT CLEANING & CCTV INSPECTION

Light cleaning and mainline CCTV inspection shall be measured by linear foot by each diameter of mainline sewer inspected and documented in accordance with the specification.

5.02 HEAVY CLEANING

Heavy cleaning shall be measured by linear foot of each diameter of heavy cleaning approved by the Program Manager and documented.

PART 6 – PAYMENT

6.01 MAINLINE CCTV INSPECTION

Light cleaning and mainline CCTV inspection shall be paid for at the unit price for each linear foot of each diameter inspected and documented in accordance with the specification.

The unit price for Light Cleaning and Mainline CCTV inspection shall cover the entire cost of the required light cleaning and CCTV inspection and reporting in accordance with PACP V 6.0.1 format, including but not limited to labor, mobilization and access, CCTV equipment, recording media, traffic control, light cleaning of mainline sewer, documenting results in PACP records and logs, digital format recordings, photo equipment, power supply for equipment, interim and final reports and all other appurtenant work.

No additional payment will be made for:
1. Re-inspection due to rejected inspection and/or records for any reason.
2. Reversals.
3. Performing excavation and associated sewer point repair to retrieve a stuck CCTV camera or hydraulic cleaning hose/nozzle.
4. Incomplete electronic logs.

6.02 HEAVY CLEANING

Heavy Cleaning shall be paid for at the unit price for each linear foot of each diameter of heavy cleaned sewers at the direction of the Program Manager and in accordance with the specification.

The unit price for Heavy Cleaning shall include the entire cost including but not limited to labor, mobilization and access, traffic control, appropriate disposal of sewer debris removed from sewer at permitted site and all other appurtenant work. Payment includes non-hydraulic jet efforts such as porcupines, cutters, power rodding, clam buckets, and other mechanical means, traffic control, and re-cleaning with hydraulic jet, labor,

materials, and equipment necessary to clean mainline sufficiently to allow video reviewers a clear picture of pipe conditions.

No additional payment will be made for:

1. Additional passes of heavy cleaning if the inspection observation reveals roots, grease or other debris remaining in the sewer after the heavy cleaning passes.

6.03 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
00003-6.01	LIGHT CLEANING & MAINLINE CCTV INSPECTION FOR EACH DIAMETER	LF
00003-6.02	HEAVY CLEANING FOR EACH DIAMETER	LF

END OF SECTION 00003

CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS
SECTION 00004 - CLOSED CIRCUIT TELEVISION & SONAR INSPECTION OF LARGER DIAMETER SEWER MAINS

PART 1 – SCOPE

1.01 This Work will consist of assessment, Pipeline Assessment Certification Program (PACP) internal closed circuit television (CCTV), and Sonar surveys to digitally inspect and record conditions of existing sanitary sewer mains and connections in 24-inch and larger diameter sanitary sewer pipe and siphons. Larger diameter sewer pipes to be inspected are located in both improved streets, arterial and primary roads, backyards and unimproved easements. No cleaning of the sanitary sewer is required prior to CCTV and Sonar inspection.

1.02 The Work covered by this section includes furnishing all labor, competent PACP certified technicians, equipment, tools, accessories, and materials required to CCTV and Sonar inspect the designated 24-inch diameter and larger sanitary sewer lines.

1.03 PACP compliant inspections, logs, data, and photos shall be delivered to the Program Manager (from hereon Program Manager shall be interpreted as "Program Manager or his designee") on external hard drives which will become property of the Program Manager. Data files shall be formatted to facilitate upload into a PACP compliant exchange database or internet uploads formats to an FTP site approved by the Program Manager.

PART 2 – MATERIALS & EQUIPMENT

2.01 MATERIALS

A. Submittals

1. Unless otherwise specified all sample submittals shall be delivered to the Program Manager within two weeks of the NTP.
2. Traffic Control Plan shall be submitted to the Program Manager, including the following items:
   a. Outline of permit acquisition procedure for lane closures.
   b. Methods for proper signing and barricades, which comply with City of Memphis requirements.
   c. Major streets (e.g. Shelby County Principal Arterial & Minor Arterial) requiring a City approved permit if taking a lane for mobile operations, secured through Traffic Control Plan submittal to the City and signed by a TN P.E. The City requires two-week lead time for permit processing.
      i. The Contractor will be required to deliver a sample primary/arterial road Traffic Control Plan for review by the City.
      ii. If the City determines that the nature of the work operation or the type of road in which the Contractor is working requires a

permit, the Contractor will be required to modify the sample Traffic Control Plan to obtain a permit from the City.

d. For everywhere else where a permit is not required, the Contractor shall develop, provide, and implement a traffic control plan for all mobile operations in accordance with standard MUTCD specifications.
e. The Contractor is also responsible for acquiring all necessary disposal and/or landfill site permits as required to perform this work.
f. Railroad Rights of Way: The Contractor shall notify the Program Manager when work or access to manholes and sanitary sewers lie within the 25 feet of railroad easement as measured by 25 feet outside the nearest rail of the tracks. To access sewer facilities within the 25 feet of the railroad right of way the Contractor shall contact the Program Manager 48 hours in advance who will alert the City's Zone Construction Inspector to coordinate individual railroad direction and guidance.

3. Site Contractor emergency phone numbers.
4. Schedules of work on a weekly basis that will be delivered no later than 2:00 PM on Thursday for the week following with daily AM email updates of approximate crew locations each day.
   a. Weekly schedule format shall contain the following elements:
      i. Map format.
      ii. Sufficient streets labeled and identified at a scale to provide clarity.
      iii. Nature and type of crew location by map area.
5. Permit required confined space entry plans in compliance with the Loss Control Manual.
6. Copies of National Association of Sewer Service Companies (NASSCO) certification for all field staff conducting PACP inspections.
7. Sample of PACP compliant television survey log in MS Access format.
8. Sample of PACP compliant video inspection in MP-4 format.
9. CCTV and Sonar inspection vehicle and equipment supplies list.
10. Sample of combined CCTV & Sonar inspection report.

2.02 EQUIPMENT

A. General

1. All equipment used for PACP compliant CCTV sewer segment inspections of existing larger diameter sanitary sewer mains shall be specifically designed and manufactured for the purpose intended under this Contract. The software and hardware for the electronic

capture of the inspection defects and recorded observations must be Version 6.0.1 NASSCO PACP compliant.

2. All CCTV equipment requirements contained in Section 00003 – Closed Circuit Television Inspection of Sewer Mains & Connections, Paragraph 2.02 are applicable, except 2.02.D. Cleaning Equipment since pre-cleaning of the larger diameter sewers is not required.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 CCTV & Sonar Inspection of Sewer Mains

A. Sewer Flow Levels During Inspection Operations

1. Maintain low sewer flow during inspection by using sandbags or flow-through plugs or by inspecting during low flow times of day, evening or early morning hours while camera is moving and recording observations in the sewer segment. Any items used to restrict flow shall be removed immediately after intended use.
   a. Flow-through Plugs: If used, secure the plugs so as to remain in place during inspection. Use a fail-safe device at the downstream pipe connection to ensure the plug is not lost in the downstream sewer segment if it becomes dislodged from the upstream pipe connection.
   b. Conduct all cleaning and CCTV operations to prevent building backups and sewer overflows.
   c. Contractor shall be responsible for cleanup, repair, fines, property damage costs, and claims for any sewage backup, spillage or sanitary sewer overflow during or as a result of the cleaning and inspection operations.
2. Allowable Depth of Flow For Inspection Operations:
   a. For effective inspection, all flow shall be minimized in the segment being inspected. However, the depth of flow at the upstream manhole of the interceptor section being worked shall be within the specified limits provided herein.
3. Maximum Allowable Depth of Flow for CCTV Inspection
   a. 24-inch diameter and Larger Pipe - 30% of pipe diameter. Flow in excess of the 30% depth of flow limitation shall include the provision for Sonar inspection for below the water surface level in addition to a raft mounted CCTV inspection for above the water level.
   b. Exceptions to these guidelines shall result in rejection, and non-payment, of the CCTV inspection unless approved in advance by the Program Manager.

B. Camera Operations

1. When flow is in excess of the 30% depth of flow limitation, the Contractor shall include the provision for Sonar inspection for below the water surface level in addition to a raft/float mounted CCTV inspection for above the water level.
2. Raft/float supports shall be collapsible to fit through existing manhole frames associated with 24-inch diameter and larger sewers.
3. Camera Operations requirements shall be as contained in Section 00003 – Closed Circuit Television Inspection of Sewer Mains & Connections, Paragraph 3.01 are applicable for the execution of the CCTV operations with the camera mounted on a raft or float, except as modified below.
4. Contractor shall be responsible for all judgments and impacts as to whether an obstruction in the sewer main can be passed. Costs involved in extracting a stuck camera in the sewer main will be borne by the Contractor and at no additional cost to the Program Manager.

C. Camera & Sonar Combined Operations

1. The combination CCTV and Sonar equipment shall be capable of inspecting a length of sewer up to at least 1,000 linear feet when entry into the sewer may be obtained at each end and up to 750 feet where a self-propelled unit is used and where entry is possible from one end only.
2. Each inspection unit shall contain a means of transporting the CCTV camera or Sonar equipment in a stable condition through the sewer under inspection. Such equipment shall ensure the maintained location of the CCTV camera and Sonar equipment when used independently on or near to the central axis of a circular shaped sewer. The maximum allowable flow depth that is permissible for the combination Sonar/CCTV is equal to 75% of the pipe diameter.
3. Where the CCTV camera or Sonar head are towed through the sewer, all winches shall be stable with either lockable or ratcheted drums. All connection shall be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera or Sonar equipment through the surcharged sewer. All winches shall be inherently stable under loaded conditions.
4. Each inspection unit shall carry sufficient numbers of guides and rollers such that, when inspecting, all connecting materials are supported away from pipe and manhole structures and all CCTV & Sonar lines used to measure the CCTV camera and the Sonar head location within the sewer are maintained in a taut manner and set a right angles where possible, to run through or over the measuring equipment.

5. The CCTV Camera and Sonar head shall be positioned to reduce the risk of picture distortion. In circular sewers the CCTV camera lens and/or Sonar head shall be positioned, when possible, centrally within the "dry" area for the CCTV and centrally within the "wet" area for the Sonar head. In non-circular sewers, picture/sonar image orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera/sonar lens shall be positioned looking along the axis of the sewer. A positioning tolerance of + 10% of the vertical sewer dimension shall be allowed.
6. When the scanning Sonar is deployed, either stand alone or combined with CCTV, the speed or travel shall be limited to 4 inches per second or 20 feet per minute.
7. A General Condition 360° CCTV rotational scan must be implemented at every 50 feet interval (min) along sewers, and at all manholes and all salient, specified, defect features. More frequent scans must be made should the condition of the pipe differ from the previous scan. The tilt must not be less than 225°.
8. The color palette shall have a minimum of 16 colors with text. The Sonar image, inside the viewing area shall be in color.
9. The picture update speed shall not result in unsatisfactory picture resolution. The range of resolution shall be 1/10 inch.
10. The maximum beam width of Sonar energy pulse shall be no greater than two degrees from the center of the transducer.
11. The transducer shall be of the continuous scanning type, the speed of which shall be 1 second per 360° scan.
12. The Contractor is responsible for hiring a licensed sub-contractor to retrieve any equipment/foreign objects that get stuck in the sewer system through the execution of the scope of work (fallen cameras, jet nozzles, inflatable plugs, sandbags etc.) at the Contractor's own cost. Such retrieval by an appropriately licensed sub-contractor shall be made within 72 hours to avoid interfering with the City of Memphis sewer system operations. Any and all impacts and related costs due to the Contractor's equipment in the line shall be the responsibility of the Contractor. Contractor shall follow SARP10 sewer point repair specifications outlined in "Section 02540 Sanitary Sewer Point Repairs" and "Section 02950 Removal and Replacement of Pavements and Incidentals" during retrieval of equipment. Also per "00585.2.2 Safety, Health, and Accident Prevention Program", Purchaser must approve sub-tier contractors prior to mobilization to the jobsite.

D. Quality Assurance

1. QA/QC shall be as contained in Section 00003 - Closed Circuit Television Inspection of Sewer Mains & Connections, Paragraph 3.01.D. Quality Assurance.

E. Deliverable Documentation

1. Mainline Sewer:
   a. Submit V.6.0.1 PACP compliant records, logs, and electronic inspection data for sewer line inspection to Program Manager by the close of business on the Monday following a week after data acquisition
   b. Digital videos, data, and photos shall be delivered to the Program Manager on external hard drives which will become property of the Program Manager.
   c. Data files shall be formatted to facilitate upload into a PACP Database with the approval of the Program Manager.
   d. Inspections displaying poor digital video/audio quality will be rejected. Quality refers to, but is not limited to, grease or debris on lens, camera under water, image too dark, image washed-out, distorted image, or out of focus images, lines improperly cleaned, and poor/no audio.
      i. Contractor will re-televise rejected inspections and resubmit inspections at no additional cost to the Program Manager.
2. Map changes/undocumented manholes:
   a. For map changes identifying undocumented manholes and network changes which were found as a result of field inspections or observations, a Map Edit Form shall also be prepared and supplied by the Contractor with a drawing or sketch and shall indicate special details, field measurement or distances, or locations about an observed undocumented manhole or a change to the sewer network. The Map Edit Form should also identify buried manholes and siphons that have been encountered.
   b. Contractor shall indicate all buried manholes identified in the field via Sonar/CCTV using the provided Buried Manhole Form. Any additional manholes that have not been located or verified via Sonar/CCTV but are impeding the completion of required Sonar/CCTV work should be designated as unable to locate (UTL) and be included on the form.
3. Sonar Reports
   a. The Contractor shall submit two hard copies of all details, i.e. a typed “Full Detail” report for each inspection, showing the position and full text of each defect encountered and their grades. The Contractor shall also supply an overall Summary Report detailing major defects and those inspections that require attention along

with a statistical report showing lengths of sewers inspected and a breakdown of sizes and lengths inspected.

b. The Contractor shall supply a MS ACCESS database and free issue software for both the viewing of the media files and the Sonar images from within the database.
c. The Sonar Inspection shall include complete structural and service assessment to the equivalent PACP standard as that obtained through conventional CCTV imagery.
d. The Sonar inspection shall include measurement of flow depth and debris/silt depth.
e. A Color High Resolution Sonar image of cross sections of the sewer must be taken (saved) every 50 feet or more frequently should the internal profile or debris/silt depth of the sewer change from the previously saved image.
f. These images are to be cross-referenced to the reports and database(s) for ease of retrieval.

PART 4 –DELIVERABLES

4.01 RECORDS

A. Digital Inspection Record

In the digital PACP V.6.0.1 compliant format, the Contractor shall provide the following information:

1. Digital CCTV survey and Sonar inspection which shall be recorded and shall be continuous as the inspection proceeds through the manholes and sewer pipes.
2. Digital Recordings: The digital recording shall document the visual and audio record of the sewer pipe inspection and shall be the basis of measurement and payment. Digital recording playback shall be at the same speed that it was recorded. Original digital recordings for the Project shall be forwarded to the Program Manager on clearly labeled external hard drive(s) in PACP ACCESS format with final report submittals and shall become the property of the Program Manager. Data for a single facility asset will not be split across multiple hard drives. Digital recordings shall be available to the Program Manager by the close of business on the Monday following a week after data acquisition. File naming must be consistent. Additional instructions, naming conventions, file structures, etc. will be provided after contract award.
   a. Picture Quality: The sewer inspection digital record shall be free of steam, fog, vapor, or other headspace distortion that degrades the quality of the picture from the intended purpose of evaluating the sewer for structural and watertight integrity. If necessary, the

Contractor shall provide positive ventilation or other means through the sewer pipe to draw out steam, fog, and vapor that will degrade the recorded image of the pipe.

B. Inspection Documentation Logs

1. CCTV Records
    a. Observations made during television inspection shall be documented in an unmodified PACP compliant manner within an electronic inspection log form, supported by accompanying audio, digital photographs and MP-4 (web optimized) format recording written to an external hard drive and submitted to the Program Manager. Hard copies of completed inspection log photographs shall be furnished to the Program Manager with invoicing.
2. Sonar Records

    a. Where combined CCTV and Sonar inspections are performed, the display in the viewing area shall show the combined CCTV and Sonar images of the sewer being inspected. The Sonar image shall be superimposed on the real CCTV image, and continuously recorded, as a combined operation at the time of the inspection resulting in a single combined video file in MP-4 (Web optimized) format for each inspection.

    b. The Sonar Inspection shall include a comprehensive final report on the findings concerning major defects including fractures, displaced joints, deformation, corrosion, lateral intrusions, dominant surface features, encrustation, and debris/silt depths.

C. Electronic & Hard Copy Records

1. Reports: The Contractor shall prepare printed inspection log reports for each associated sewer pipe inspected during the actual field inspection activities. These field logs shall then be reviewed by the Contractor's technical staff, along with reviewing the associated digital video record, as a means of ensuring that no defects or entries are omitted or incorrect. Edited field logs shall then be used in the final project reports and submitted in pdf format.

2. Draft Report and Final Report: The Draft Final Report will contain electronic and hard copies of each of the PACP CCTV log pipe segment inspection logs. Digital recordings of the inspections written to an external hard drive and the PACP compliant database of the inspections in ACCESS format shall also be submitted in electronic and pdf format.

   Draft Report shall be delivered to the Program Manager within fifteen working days of oldest inspection. The Program Manager will have two workweeks to review and comment. The Contractor shall address all comments provided and submit a Final Report within one workweek upon receipt of comments. At the Program Manager's discretion a meeting will be held so the Contractor can explain the processes used to address the comments.

D. Meetings

The Program Team will arrange bi-weekly meetings (every other week) with the contractor to discuss data management and field issues.

E. Quality

Rejection of deliverables will be submitted to the Contractor via the Program Team in a written communication discussing issues that must be addressed. The Contractor will be required to follow up with a response within three business days upon receipt of the written communication. Contractors will have seven (7) calendar days from the rejection notice date to make the necessary corrections and resubmit the data deliverable in its entirety.

PART 5 – MEASUREMENT

5.01 CCTV & SONAR INSPECTION

CCTV & Sonar inspection shall be measured by linear foot by each diameter of mainline sewer inspected and documented in accordance with the specification.

PART 6 – PAYMENT

6.01 CCTV & SONAR INSPECTION

CCTV & Sonar inspection shall be paid for at the unit price for each linear foot of each diameter inspected and documented in accordance with the specification.

The unit price for CCTV & Sonar inspection shall cover the entire cost of the required CCTV & Sonar inspection and reporting in accordance with PACP V 6.0.1 format, including but not limited to labor, mobilization and access, CCTV equipment, recording media, traffic control, light cleaning of mainline sewer, documenting results in PACP records and logs, digital format recordings, photo equipment, power supply for equipment, interim and final reports, and all other appurtenant work.

No additional payment will be made for:
1. Re-inspection due to rejected inspection and/or records for any reason
2. Incomplete electronic logs for either CCTV or Sonar digital records

6.02 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
00004-6.01	CCTV & SONAR INSPECTION FOR EACH DIAMETER	LF

END OF SECTION 00004

CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATION modified by SARP10 Program

SECTION 02540 SANITARY SEWER POINT REPAIRS

The Subcontractor shall complete the Work in accordance with Section 02540 herein and supplemented by the City of Memphis Standard Construction Specifications, which are available for viewing at the SARP10 Program Office.

PART 1 - SCOPE

This section covers the performance of point repairs on gravity sewer lines.

1.01 REFERENCES

A. City of Memphis Standard Construction Specifications.

B. American Standard for Testing and Materials (ASTM).

C. American National Standards Institute (ANSI).

1.02 DEFINITIONS

A point repair as used in these Specifications shall mean repair of pipe segments of existing sanitary sewer mains or service lines and connections which require excavation to accurately locate a defect and make the necessary repair.

PART 2 - MATERIALS AND EQUIPMENT

2.01 PIPE MATERIAL

All repairs to existing gravity sewer lines shall be made using ductile iron pipe. Ductile iron pipe for gravity sewer and service connections will conform to ASTM A 746. The pipe thickness design will conform to ANSI A 21.50. If no thickness class is specified on the Plans or Subcontract Documents, Class 50 or approved equivalent will be used. All ductile iron pipe will be lined with Protecto 401 Ceramic Epoxy, or approved equal. Linings will be applied according to manufacturer's recommendations. Fittings will conform to the requirements of ANSI A 21.10. Unless otherwise specified, joints will be push on gasket type conforming to the requirements of ANSI A 21.11. Mechanical joints will conform to the requirements of ANSI A 21.11. Flanged joints will conform to the requirements of ANSI A 21.15. Steel retainer rings will conform to ASTM A 148 for Grade 90 60.

2.02 ELASTOMERIC COUPLINGS

Elastomeric couplings for connecting replacement pipe to existing pipe shall be Fernco Series 5000 RC Shielded Couplings with nut and bolt clamp, Mission "Flex-Seal" adjustable shielded repair coupling or approved equal.

2.03 BACKFILL UNDER PAVEMENT

Backfill beneath all paved areas shall be either crushed limestone or recycled crushed concrete.

Crushed limestone will be size No. 67 Coarse Aggregate meeting the requirements of the Tennessee DOT Standard Specifications for Road and Bridge Construction and the following gradation:

	Total Percent by Dry Weight, Passing Each Sieve (U.S. Standard)				
Size No.	1"	3/4"	3/8"	No. 4	No. 8
67	100	90-100	20-55	0-10	0-5

PART 3 - CONSTRUCTION REQUIREMENTS

3.01 SITE PREPARATION AND RESTORATION

A. Rights-of-Way and Easements

The Subcontractor will confine his construction activities to the existing rights-of-way or sanitary sewer easements. The Subcontractor will be responsible for obtaining written agreements for use of private property outside City acquired rights of way/easements for such purposes as storage of material and equipment and access to the construction site. The Subcontractor will immediately provide a copy of all such written agreements to the City upon obtaining the same.

B. Clearing of Rights-of-Way and Easements

The Subcontractor will confine his clearing of rights of way and easements to the least area necessary for construction of facilities shown on the Plans. The Subcontractor will protect as many trees and shrubs within the area as possible. Where necessary for construction, the Subcontractor will clear all live and dead vegetation and growth, pole stubs, logs, and other objectionable material. Cleared material will be removed to within 3 inches of existing ground. This work will be done well before excavation operations but only after erosion controls have been placed.

C. Location of Existing Obstructions

Locations of obstructions shown on the Plans are approximate and are not intended as an accurate location of such obstructions. Obstructions not shown on the Plans but encountered by the Subcontractor will be removed and replaced in their original state or protected by the Subcontractor at no additional cost to the City.

D. Removal of Obstructions

The Subcontractor will demolish and remove all structures and structure foundations, abandoned vehicles, appliances, and rubbish within the right of way/easement limits necessary for the performance of the work.

E. Protection of Obstructions Outside Easement Limits

The Subcontractor will protect and avoid damage to all trees, shrubs, plants, fences, structures, and all other objects outside the right of way/easement limits shown on the Plans and/or Plats due to construction operations. All damage will be repaired or restored at the Subcontractor's expense. Particular attention will

be paid to avoid damage to trees, shrubs, bushes, and private property located next to rights of way/easements. No trees, plants, or other objects may be removed out-side such limits without written permission of the property owner.

F. Special Protection of Obstructions Inside Easement Limits

Wherever the underground installation of sanitary sewer facilities will go through surface improvements previously made by the City, other governmental bodies, or property owners, the Subcontractor will be responsible for their protection and preservation. This responsibility includes the removal and storage of such improvements to allow replacement and restoration as close as possible to the undisturbed condition.

G. Disposal of Debris

All trees, brush, logs, snags, leaves, sawdust, bark, and refuse will be collected and disposed of according to the City Code of Ordinances at the expense of the Subcontractor. There will be no separate pay item for disposal of debris. Debris will be removed from the site when practical and will not be left until the completion of the contract. When material is to be disposed of outside the easement, the Subcontractor will first obtain written permission from the property owner on whose property the disposal is to be made and will file a copy with the Purchaser. Unless otherwise provided in the Subcontract Documents, the Subcontractor will arrange for disposing of such material outside the right of way/easement. No debris will be deposited in wetlands.

H. Replacement of Fences

Any fences disturbed inside the right of way/easement limits will be replaced or restored to their original or better condition. Any fences removed will be replaced in their original location. Fences in such poor condition that they cannot be taken down and rebuilt with the same material will be replaced with new fence material similar in original quality, size, and appearance to the removed fence. Exceptions to this requirement will be allowed if written releases are obtained from the property owners by the Subcontractor and submitted to the Purchaser.

I. Disposition of Excavated Material

1. Excavated material suitable for backfill will be stored no closer than 2 feet from the edge of the excavation. Excavated material will not obstruct crosswalks, side-walks, driveways, street intersections, nor interfere unreasonably with travel on streets. Gutters or other surface drainage facilities will not be obstructed. The Subcontractor must provide access to fire hydrants, mail boxes, sewer and conduit manholes and similar utility or municipal service facility as required. Excavated material intended for backfill will be stored in a way that minimizes loss of excavated material due to erosion. The Subcontractor shall comply with all applicable OSHA regulations and City of Memphis Storm Water Ordinances.

2. Unless otherwise directed, all excavated material that will not be used for backfilling or restoration will be removed from the site and disposed of by the Subcontractor. If the Subcontractor proposes to store or place such excess excavated material upon any private property, written consent of the property

owner or owners must be obtained by the Subcontractor in advance. A certified copy will be given to the Purchaser. No surplus or excess material will be deposited in any stream channel nor anywhere that would change preconstruction surface drainage.

J. Control of Water

1. The Subcontractor will keep all excavations free of water. If the trench subgrade consists of good soil in good condition at the time of excavation, it will be the Subcontractor's responsibility to maintain it in suitable condition. Dams, flumes, channels, sumps, or other work and equipment necessary to keep the excavation clear of water will be provided by the contractor. Dewatering of trenches, will be incidental to trench excavation. The Subcontractor will avoid producing mud in the trench bottom by his operations. If necessary or so ordered by the Purchaser, the Subcontractor will re-move any soil that becomes unacceptable and replace it with limestone or other approved aggregate at his own expense to maintain a firm, dry base.

2. Pipe bedding, laying, jointing, and the placing of concrete or masonry will be done in a water free trench or excavation. Trenches will be kept clear of water until pipe joints, concrete and masonry have set and are resistant to water damage. The water will be disposed of in a manner acceptable to the Purchaser.

3. All gutters, pipes, drains, conduits, culverts, catch basins, storm water inlets, ditches, creeks, and other storm water facilities will be kept in operation, or their flows will be satisfactorily diverted and provided for during construction. Any facilities disturbed during construction will be restored to the satisfaction of the Purchaser.

K. Excavation Around Obstructions

1. The Subcontractor will perform all excavation by hand where excavation by machinery would endanger trees, structures, or utilities that otherwise might be saved by hand excavation.

2. The Subcontractor will cautiously excavate test holes to find the limits of under-ground obstructions anticipated within the excavation. When a water pipe, gas pipe, other sanitary sewer, storm drain, or similar utility comes within the limits of the trench, such facilities will be properly supported.

L. Special Protection

1. Treacherous Ground: When running sand, quicksand, or other treacherous ground is encountered, the work will be carried on with the utmost urgency and will continue day and night should the Purchaser so direct.

2. Sheeting and Shoring: The Subcontractor will furnish, place, and maintain sheeting and shoring as required to support the sides of any excavation to prevent earth movement that could endanger the workers or public and to prevent damage to the excavation, adjacent utilities or property. The Subcontractor will place this sheeting and shoring without the Purchaser’s instructions.

3. Sheeting will extend below structure invert a sufficient depth to assure adequate support. In the installation of sheeting, the use of vibratory type pile drivers (as opposed to impact type) will be limited to sheeting driven no greater than 5 feet below the invert. The sheeted trench width, as measured between those faces of the sheeting in contact with the earth trench wall, will not exceed the maximum width of a trench per Specification Section 02530 Paragraph 3.02.B. Walers and struts will be designed and installed to present no obstructions to proper placement of the pipe, bedding, cradle or encasement, and they will not interfere with the satisfactory installation of the pipe.

4. Sheeting, bracing, and shoring will be withdrawn and removed as the back-filling is being done, except where the Purchaser permits the material to be left in place. The Subcontractor will cut off sheeting left in place at least 2 feet below the surface and will remove the cut off material from the excavation.

5. All sheeting, bracing, and shoring which are not left in place under this provision will be removed in a way that will not endanger the completed work or other structures, utilities, storm drains, sewers, or property. The Subcontractor will be careful to prevent the opening of voids during the extraction process.

6. If sheeting and shoring are not specifically required on the Plans or in the Specifications, steel drag shields or trench boxes may be used subject to the authorization of the Purchaser. Voids left by the advancement of the shield will be carefully backfilled and compacted following trench backfill requirements.

M. Existing Utilities

1. Location: It will be the Subcontractor's responsibility to arrange for the location of existing utilities prior to excavation. The Subcontractor will also be responsible for coordinating the relocation of any existing utilities with the appropriate utility owner.

2. Protection: The Subcontractor will protect any storm drain, sewer, or utility within the limits of the construction. The Subcontractor will proceed with caution and will use every means to establish the exact location of underground structures and facilities before excavating in the vicinity. The City or Purchaser will not be responsible for the cost of protection or repair or replacement of any structure, pipe line, conduit, service connection, or similar facility broken or damaged by the Subcontractor's operations. All water and gas pipes and other conduits near or crossing the excavation will be properly supported and protected by the Subcontractor.

3. If the construction requires the removal and replacement of any overhead wires or poles, underground pipes, conduits, structures or other facilities, the Subcontractor will arrange for such work with the Owner or Owners of the facilities. No additional payment will be made by the City or Purchaser for this work.

4. Service Connections: Sewer and utility services between mains and buildings will be maintained and adjusted as necessary by the Subcontractor to provide as

nearly a continuous operation as can be expected. This will be accomplished in any way that the Subcontractor chooses, provided the individual service is not interrupted for more than two consecutive hours. The occupants will be notified by the Subcontractor at least six hours before such service interruptions. When a break occurs, the Subcontractor will notify the affected occupant(s) of the probable length of time that the service will be interrupted.

5. If existing underground facilities or utilities require removal and replacement for the performance of this work, all replacements will be made with new material conforming to the requirements of these Specifications. If not specified, the material will be as approved by the Purchaser.

6. The removal and replacement of water services to adapt to new construction will be the Subcontractor's responsibility within the limits where the new service line grade blends smoothly with the existing service line grade.

7. The removal and replacement of sewer house connections to adapt to new construction will be the Subcontractor's responsibility from the sewer main to a point where the new grade and existing grade can be matched.

8. The Subcontractor will be responsible for any damage to the sewer house connection because of his operations. The Purchaser does not guarantee the number, size, condition, nor length of adjustment necessary to bring a service to a new grade.

N. Maintenance of Flow

Where existing sewer lines are being modified, the Subcontractor will arrange his work so that sewage flow will be maintained during the construction period with no discharge of sewage into the open trench, and no back up of sewage in the existing line. The Subcontractor will provide necessary bypass pumping capacity to carry flow downstream of the section to be modified.

3.02 BACKFILLING

A. General

1. After sanitary sewer facilities have been bedded and installed according to these Specifications and upon permission of the Purchaser, the backfill may be placed. Backfilling operations will continue following as closely behind pipe installation as practical. All backfill will be placed in uniform horizontal layers. Pushing backfill material down a ramp into excavated areas will not be permitted. No trash will be allowed to accumulate in the space to be backfilled. Particular care will be taken to avoid allowing wood to be included in the backfill, other than sheeting and shoring that has been approved to be left in place.

2. The Subcontractor will be responsible for the condition of the trenches and filled areas during the contract and warranty period. The Subcontractor will maintain

frequent inspection of the same. Anytime during the 12-month warranty period the trenches or filled areas settle and sunken places appear, the Subcontractor will be required to refill these sunken places when they are discovered with suitable material and will replace all damaged curb, gutter, and sidewalk. All soft or dangerous trenches will be marked, barricaded and caution lighted for the protection of the public.

3. Property with an existing dwelling located on it or lots within a developed subdivision or planned development are considered improved property.

B. Street Right of Way and Improved Property

1. Backfill Material: Backfill for pipe trench excavations through pavements in street or highway right of way or where the Purchaser orders, will be made with pit run gravel or other acceptable material as approved by the Purchaser. The backfill will be from the top of the bedding material or foundation to the subgrade elevation of the pavement. Pea gravel or similar granular material approximately uniform in size and without bonding properties will not be used.

2. Backfill for pipe trench excavations beyond pavements in street or highway right of way or outside public right of way will be made with select earth from the top level of the bedding material or foundation to the subgrade elevation in paved area, or within 1 inch of the surface in areas to be sodded, or to the surface in all other areas.

3. Select material will be free from debris, organic matter, perishable compressible material and will contain no stones or lumps larger than 6 inches. Rocks and lumps smaller than 6 inches will not exceed an amount that will interfere with the consolidating properties of the fill material. Care will be taken that stones and lumps are kept separated and well distributed, and that all voids are completely filled with fine material. No rocks or lumps will come in direct contact with the pipe. The upper 3 feet of backfill in sodded or planted areas will be free of rocks or lumps larger than 1 inch in diameter.

4. Placement and Compaction: Backfill material will be placed by hand in 6 inch loose layers and tamped to a point 2 feet above the outside top of the pipe. Backfill will be compacted with suitable mechanical tamping equipment with special care being taken not to damage the pipe or joints. Use of compaction equipment directly above semi-rigid and flexible pipe should be avoided until sufficient backfill has been placed to ensure that the equipment will not damage the pipe. A minimum of 36 inches of compacted backfill above the top of semi-rigid and flexible pipe will be in place before wheel loading and a minimum of 48 inches of compacted backfill before use of pneumatic tampers. From these elevations to the subgrade elevation of the pavement, bottom of the sod, or to the original ground surface, suitable backfill will be mechanically placed in 9 inch, maximum, loose layers. All backfill material will be compacted to 95 percent of maximum density at plus or minus 2 percent of optimum moisture content as determined by Laboratory Standard Proctor Test (ASTM D 698).

C. Open Areas and Unimproved Property

Backfill of excavations on unimproved property will be made with select material from the top level of bedding material or foundation to the surface. Non-granular select material to be used for backfill will be free from debris, organic matter and perishable compressible material, and will contain no stones or lumps or rock fragments larger than 6 inches. Rocks or lumps smaller than 6 inches in diameter will not exceed an amount that will interfere with the consolidating properties of the fill material. No rocks or lumps will come in direct contact with the pipe. Stones and lumps will be kept separated and well distributed, and all voids will be completely filled with fine material.

3.03 METHOD OF REPAIR

A. The Subcontractor shall replace a sufficient number of entire pipe joints to ensure that defective pipe is removed and replaced up to 10 feet in length, per repair, at the discretion of the Purchaser, in accordance with the SARP10 Sanitary Sewer Point Repair detail.

B. If the length of the required replacement segment is not adequate to locate sufficient competent pipe for connection with the new section, the Subcontractor, at the Purchaser's instruction, may be directed to replace additional sections of pipe such that an appropriate connection is possible.

C. The Subcontractor shall replace service wyes encountered within the point repair. Any defective service lines encountered within the point repair shall be replaced.

D. Any service line or competent main line pipe broken by the Subcontractor shall be replaced at the Subcontractor's expense.

E. The Subcontractor shall remove any fences, base materials, storm sewer, etc. that may interfere with the repair made at each specified point. The Subcontractor is responsible for the replacement of said fences, base materials, storm sewer etc., in the same or better condition than found.

F. The bottom of the trench shall be reshaped so that the grade of the pipe replaced will match that required for the existing sewer line. The point repair shall be backfilled in accordance with Section 02530 Sewer Pipe Installation of the City of Memphis Standard Construction Specifications.

G. If the material in the bottom of the trench is of such consistency that it is not stable, then the Subcontractor shall stabilize the bottom of the trench by placing suitable materials at the direction of the Purchaser.

H. Prior to backfilling, point repairs shall be inspected by the Purchaser.

3.04 VISUAL INSPECTION

All work will be subject to visual inspection for faults or defects and any such deviation or omission will be corrected at once. All tests will be made by the Subcontractor who will provide necessary equipment for testing and lamping the

system in the presence of and under the supervision and instructions of the Purchaser. Lamp tests will be observed first hand by the Purchaser. Each section of sewer line will show a full circle of light when lamped between manholes. All defects located will be corrected before conducting leakage tests

After backfilling and resurfacing, sewer segments containing point repairs shall be internally televised (CCTV) by the Subcontractor in their entirety in accordance with Section 00003 – Closed Circuit Television Inspection of Sewer Mains and Connections for final review and approval by the Purchaser.

3.05 TRAFFIC CONTROL

All traffic control shall be installed and maintained in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). At a minimum, the Subcontractor must have two trucks with flashing yellow lights on the work site. Traffic cones must also be placed downstream of the construction site to divert cars into the adjacent lane(s) per MUTCD requirements. On roads with a heavy traffic volume, a flagman may also be needed to assist with traffic control. For bidding purposes, the Subcontractor should assume that a flagman will be needed on 30 percent of the setups.

3.06 FALL PROTECTION

Subcontractor shall install and maintain all fall protection measures in accordance with the SARP10 Loss Control Manual. The Subcontractor shall construct a controlled access zone around the manhole being adjusted. At a minimum, the fall protection zone shall include traffic cones encircled with pennant tape. The controlled access zone must have one point of access with an entrance log.

3.07 REMOVAL & REPLACEMENT OF VEGETATED AREAS

The Subcontractor shall remove the vegetated area around a manhole as needed to adjust the manhole frame and cover. All disturbed areas shall be restored as nearly as practical to their original condition. The disturbed area shall be cleared and raked to the level of the existing turf and then watered. New sod shall be installed over the entire disturbed area. New sod shall consist of live, dense, well rooted growth of Bermuda grass, free from Johnson grass, nutgrass, and other obnoxious grasses or weeds, well suited for the intended purpose and for the soil in which it is to be planted. All sod shall be cleanly cut in strips having a reasonably uniform thickness of not less than 2 inches and cut in 10 to 12 inch squares.

3.08 CLEANUP

After the installation work has been completed, the Subcontractor shall cleanup the entire project area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Subcontractor. The work area shall be left in a condition equal to or better than it was prior to the performance of the Work. Disturbed grassed areas shall be seeded or sod placed as directed

by the Purchaser at no additional cost to the Owner. Site restoration shall be performed in accordance with the City of Memphis Standard Construction Specifications.

PART 4 – MEASUREMENT

4.01 SEWER POINT REPAIR

Sewer point repairs will be measured per each. The repair length of ten linear feet will be measured along the centerline of the new pipe. Each additional linear foot of repair, directed by the Purchaser, beyond the minimum 10 feet will be measured for payment. The depth of the repair is measured from the existing grade to the pipe invert.

4.02 TRAFFIC CONTROL

Traffic control will be paid per each sewer point repair.

4.03 REMOVAL & REPLACEMENT OF VEGETATED AREAS

The removal and replacement of vegetated areas shall be measured per square yard upon which the new sod has been set.

4.04 PAVEMENT BACKFILL

Crushed limestone or recycled crushed concrete for backfill under pavements or other areas directed by the Purchaser will be measured by the ton of material in place. The depth of the backfill is measured from the top of the existing pavement surface to the top of the haunching.

PART 5 – PAYMENT

5.01 SEWER POINT REPAIR

The accepted quantities of all mainline sewer point repairs will be paid for at the contract unit price per each for the various pipe sizes and depth of repair, which will be full compensation for material and material testing, excavation, special protection, protection of existing utilities, maintenance of sewage flow, bedding, haunching, laying, jointing, cleaning and inspection, conducting acceptance tests, installation of pipe wyes, connection to manholes, adapters and couplings, stoppers, and removal and/or abandonment of existing pipe within the limits of excavation and backfilling outside pavement areas.

5.02 TRAFFIC CONTROL

Traffic control will be paid per each sewer point repair including all appurtenances required to comply with MUTCD standards.

5.03 REMOVAL & REPLACEMENT OF VEGETATED AREA

Removal and replacement of vegetated area will be paid for at the Subcontract unit price per square yard for the accepted quantities, which price will be full payment for furnishing, setting, pinning and pegging if required, fertilizing, watering, mowing, providing

and placing agricultural limestone, and for the maintenance and repair of the sodded area.

5.04 PAVEMENT BACKFILL

Accepted quantities of crushed limestone or recycled crushed concrete for initial backfill or final backfill under pavements or other areas designated by the Purchaser will be paid for at the Subcontract unit price per ton furnished and placed, which will be full compensation for furnishing, placing and compacting the selected material.

5.05 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
02540-5.01.01	Sewer Point Repair, 6” through 10” Pipe (<10’ Deep)	Each
02540-5.01.01a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 6” through 10” Pipe (<10’ Deep)	Linear Foot
02540-5.01.02	Sewer Point Repair, 6” through 10” Pipe (10.1’-15’ Deep)	Each
02540-5.01.02a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 6” through 10” Pipe (10.1’-15’ Deep)	Linear Foot
02540-5.01.03	Sewer Point Repair, 6” through 10” Pipe (15.1’-20’ Deep)	Each
02540-5.01.03a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 6” through 10” Pipe (15.1’-20’ Deep)	Linear Foot
02540-5.01.04	Sewer Point Repair, 12” through 18” Pipe (<10’ Deep)	Each
02540-5.01.04a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 12” through 18” Pipe (<10’ Deep)	Linear Foot
02540-5.01.05	Sewer Point Repair, 12” through 18” Pipe (10.1’-15’ Deep)	Each
02540-5.01.05a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 12” through 18” Pipe (10.1’-15’ Deep)	Linear Foot
02540-5.01.06	Sewer Point Repair, 12” through 18” Pipe (15.1’-20’ Deep)	Each
02540-5.01.06a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 12” through 18” Pipe (15.1’-20’ Deep)	Linear Foot
02540-5.01.07	Sewer Point Repair, 21” through 24” Pipe (<10’ Deep)	Each

02540-5.01.07a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 21" through 24" Pipe (<10' Deep)	Linear Foot
02540-5.01.08	Sewer Point Repair, 21" through 24" Pipe (10.1'-15' Deep)	Each
02540-5.01.08a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 21" through 24" Pipe (10.1'-15' Deep)	Linear Foot
02540-5.01.09	Sewer Point Repair, 21" through 24" Pipe (15.1'-20' Deep)	Each
02540-5.01.09a	Each additional linear foot beyond the 10 feet minimum, for Sewer Point Repair, 21" through 24" Pipe (15.1'-20' Deep)	Linear Foot
02540-5.01.10	Each service connection and associated lateral pipe included in a Sewer Point Repair, all depths, all diameters	Each
02540-5.02	Traffic Control per Point Repair	Each
02540-5.03	Removal & Replacement of Vegetated Area	Square Yard
02540-5.04	Pavement Backfill	Ton

END OF SECTION 02540

CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS modified by SARP10 Program

SECTION 02950 REMOVAL AND REPLACEMENT OF PAVEMENTS AND INCIDENTALS

PART 1 – SCOPE

This Work shall consist of the removal and replacement of pavements, sidewalks, driveway aprons, curbs and gutters, driveways, paved areas, and curbs made necessary by the improvement of sanitary sewer infrastructure, and other items of construction that require temporary cuts. Such replacement shall be to a condition at least equal to the condition existing prior to removal and of in-kind material and shall be compliance with the Drawings, these Specifications, or as directed by the Purchaser. The Work which will be included in the Subcontract and for which the Subcontractor shall be compensated therefore is limited to that area within the rights-of-way and construction easements for the Project. The Subcontractor will not be compensated for the removal and replacement of facilities outside the rights-of-way, easements, and limits of construction of the Project.

PART 2 – MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Concrete: Portland cement concrete shall have a minimum 28 Day compressive strength of 3,000 psi with a slump of 3-5 inches. The portland cement used in the mix shall be Type I cement conforming to the requirements of AASHTO M 85. The delivery ticket accompanying each load of concrete shall show the class and quantity of concrete, the quantity of cement, aggregates, water, and additive used in the batch, and the time of batching. Materials used in the concrete shall be tested and approved.

B. Asphaltic Concrete Pavement: Asphaltic concrete surface courses shall meet the requirements of Mix No. 1 and bases courses shall meet the requirements of Mix No. 2 as described below.

1. The composition of the mixes shall be as follows:

	Total Percent Passing by Weight	
Sieve Size	Mix No. 1	Mix No. 2
2”	100	100
1-1/2”	100	100
3/4”	100	100
3/8”	76 - 96	65 - 95
No. 4	51 - 76	45 - 70
No. 8	36 - 60	25 - 50
No. 30	16 - 40	12 - 30
No. 100	3 - 12	2 - 12
No. 200	2 - 8	1 - 6

2. The proportions of the total mixture, in percent by weight, shall be as follows:

Courses	Combined Mineral Aggregate	Asphalt Cement
Mix No. 1, Surface	92.0 – 96.0	4.0 – 8.0
Mix No. 2, Binder	93.0 – 97.5	2.5 – 7.0

3. It is the intent of this Section of the Specifications that the above described mixes shall conform to the following mixtures specified in the Tennessee Department of Transportation Standard Specifications for Road and Bridge construction.

   Mix No. 1 – Section 411, Asphaltic Concrete Surface (Hot Mix), Grading E.
   Mix No. 2 – Section 307, Bituminous Plant Mix Base (Hot Mix), Aggregate Grading C.

4. For multiple layer construction, succeeding layers shall not be laid until the previous layer has cooled sufficiently to support the construction equipment

5. When Mix No. 1 is to be used as a surface for traffic lanes, the mineral aggregate shall be composed of not less than 50 percent nor more than 55 percent crushed limestone and not more than 50 percent nor less than 45 percent natural sand. When Mix No. 1 is used for surfacing of shoulders or other non-traffic lane construction, the mineral aggregate may be composed entirely of limestone, including screening and manufactured sand, but in no case shall the mineral aggregate for this construction consist of less than 50 percent limestone. The natural sand shall be so graded that not more than 5 percent will be retained on the No. 4 sieve.

C. Expansion Joint Filler: Preformed expansion joint filler shall be of the bituminous type, shall conform to the requirements of AASHTO M 213 and shall not be more than 1 inch or less than 1/2 inch in thickness. The filler shall be cut to the full depth of pavement, curb and gutter, sidewalk, or driveway being replaced.

D. Gravel Pavement or Base: Crushed limestone with such material as manufactured sand or other fine materials naturally contained or added thereto as needed to match existing conditions and conform to the gradations shown below:

Grading Table for Graded Aggregate Base Course
Total Percent, by Dry Weight, Passing Each Sieve (U.S. Standard)

Size No.	2 ½ "	2"	1 ½ "	1"	3/8"	No. 40
1	100	95-100			35-65	10-30

2.02 EQUIPMENT

A. Equipment and tools necessary for cutting, removal, and hauling of existing items; handling and placement of new material; and all equipment necessary to perform all parts of the Work shall be at the job site sufficiently ahead of the start of construction operations to be examined and approved by the Purchaser.

B. When saws are used to cut pavement, the Subcontractor shall provide sawing equipment adequate in power to complete the sawing to a minimum of 1-1/2 inches below the pavement surface in one pass. An ample supply of saw blades shall be maintained at the site of the Work at all times during sawing operations.

C. Other types of pavement cutting equipment shall be capable of cutting the pavement to a neat straight line of 1-1/2 inch minimum depth below the pavement surface in one pass.

D. The Subcontractor shall provide equipment capable of removal of pavements, sidewalks, driveway aprons, curbs and gutters, driveways, paved areas, and curbs without disturbance of adjacent items to remain in place.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 REMOVAL OF ASPHALT PAVEMENT

Asphalt pavement shall be removed to a clean straight line as shown on the drawing details. Pavement shall be cut by saw or other equipment approved by the Purchaser in advance. Edges of existing asphalt pavement adjacent to trenches, where damaged, shall be recut in a clean straight line within the limits of damaged pavement only. Such recuts shall be parallel to the original cuts and perpendicular to the pavement surface.

3.02 REMOVAL OF CONCRETE PAVEMENT

Concrete pavement shall be removed to a neat straight line as shown on the drawing details. Care shall be used to avoid damage to pavements and to the pavement base remaining in place.

3.03 REMOVAL OF CONCRETE SIDEWALK, CURB AND GUTTER, AND DRIVEWAY

Concrete sidewalks, curbs and gutters, and driveways shall be removed to the nearest contraction or expansion joint. Care shall be used to avoid damage to sidewalks, curbs and gutters, and driveways remaining in place.

3.04 REMOVAL OF GRAVEL PAVEMENT

Gravel surfaces encountered in construction shall be removed as needed to allow for the adjustment of the manhole frame and cover.

3.05 REPLACEMENT OF PAVEMENT

A. Asphalt Pavements

1. Replace asphalt paving courses to match existing thickness. The minimum surface course thickness shall be 2 inches. Asphalt pavement and base replacement shall be constructed for the entire cross-section of pavement removal area including all areas where pavement was re-cut subsequent to the initial pavement removal.

B. Concrete Pavements

1. Concrete pavement shall be replaced with Class A concrete pavement equal in thickness to the pavement removed but not less than 4 inches thick. Concrete pavement and base replacement shall be constructed for the entire cross-section of pavement removal area including all areas where pavement was re-cut subsequent to the initial pavement removal.

2. Reasonable efforts shall be made to avoid contrast in the color and texture of existing and restored surfaces.

C. Placing, Curing, and Protection of Concrete

1. After the backfill in the trench has been brought to the appropriate subgrade elevation shown on the Plans, compacted to the specified density, and permission has been given by the Purchaser, a concrete slab of the appropriate thickness shall be placed within the entire disturbed area.

2. Any loose or disturbed pavement or base shall be removed prior to placement of the concrete. Concrete shall be placed only on a moist subgrade and shall not be

placed unless the ambient temperature is 35° F and rising. In no case shall concrete be placed on a frozen or frosty subgrade. After the concrete is placed, it shall be struck off in an approved manner to the appropriate grade as shown on the Plans and shall be finished with floats and straight edges until the required surface texture has been obtained.

3. No vehicles or loads shall be permitted on any concrete until the Purchaser has determined that the concrete has obtained sufficient strength for such loads. The Subcontractor shall construct and place such barricades and protection devices as are necessary to protect the concrete.

3.06 REPLACEMENT OF SIDEWALKS, DRIVEWAY APRONS, CURBS AND GUTTERS, DRIVEWAYS AND OTHER PAVED AREAS, AND CURBS

A. Concrete sidewalks and driveway aprons shall be replaced in accordance with the City of Memphis Standard Construction Specifications.

B. Unless otherwise directed, curb and gutter shall be replaced with new concrete curb and gutter of the same cross-section and at the same top of curb elevation and flow line as that removed. Where curb and gutter of a different type than existing is to be used for replacement, the replacement flow line shall match existing and a transitions section provided between the existing and replacement cross-sections. Curb heights shall be transitioned at a rate of 1 inch in 5 feet. Granite curb shall be replaced with new concrete curb whose height matches existing adjacent curb top elevations. Any expansion joint material removed shall be replaced at the original locations. Existing concrete edges shall be cleaned prior to placement of concrete. The finished curb and gutter cross-section, elevations, texture, and color shall conform to the adjacent concrete surfaces.

C. Replacement of paved areas other than street pavement; concrete, asphalt, or gravel driveways; and asphalt or concrete curb within the right-of-way or construction easement limits shall be in kind for those cross-sections removed, unless directed otherwise by the Purchaser.

3.07 DAMAGE DUE TO SETTLEMENT

A. The Subcontractor shall be responsible for any damage caused by settlement of backfill placed beneath pavements, sidewalks, driveway aprons, curbs, curbs and gutters, driveways, paved areas other than street pavement, and asphalt or concrete curb within the right-of-way or construction easement limits. This includes any damage which may occur at any time prior to, and during a period of one year from the date of Final Completion of the Work covered by the Subcontract.

B. During such period, the Subcontractor shall at his own cost and expense refill all excavations where settlement damage has occurred and replace damaged pavements, sidewalks, driveway aprons, curbs, curbs and gutters, paved areas, driveways, and all other damaged items to the satisfaction of the Purchaser. Should the Subcontractor fail to repair settlement damage which may occur as described above within 5 days after being given notice thereof, the Purchaser shall have the right to repair such settlement and charge the cost of such repairs to the Subcontractor.

3.08 DAMAGE OUTSIDE CONSTRUCTION EASEMENT LIMITS

The Subcontractor will be held responsible for all damage to roads, highways, shoulders, curbs and gutters, ditches, embankments, bridges, culverts, and other property, caused by him or any of this Sub-subcontractors in hauling or otherwise transporting materials to and from the several sites of Work, regardless of the location of such damage. The

Subcontractor shall make arrangements relative to the payment for, or repair or replacement of, such damage or damaged surfaces or structures which are satisfactory and acceptable to the Purchaser, at the Subcontractor's cost and expense.

PART 4 – MEASUREMENT

4.01 PAVEMENT REMOVAL AND REPLACEMENT
Pavement removal and replacement shall be measured for payment by the cubic yard, complete in place.

4.02 CONCRETE SIDEWALK REMOVAL AND REPLACEMENT
Sidewalk removal and replacement shall be measured for payment by the square foot, complete in place.

4.03 CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT
Curb and gutter removal and replacement shall be measured for payment by the linear foot, complete in place.

4.04 GRAVEL DRIVEWAY AND GRAVEL AREA REMOVAL AND REPLACEMENT
Gravel driveways and gravel area removal and replacement shall be measured for payment by the ton of crushed limestone, complete in place.

PART 5 – PAYMENT

5.01 PAVEMENT REMOVAL AND REPLACEMENT
The accepted quantities of pavement removal and replacement shall be paid for at the Subcontract unit price per cubic yard for the type specified, which price will be full compensation for cutting and recutting pavement; removal and disposal of pavement and base; preparing the subgrade; placing, finishing, curing, and protection of concrete; and placing and compacting asphaltic concrete wearing surfaces, complete in place.

5.02 CONCRETE SIDEWALK REMOVAL AND REPLACEMENT
The accepted quantities of sidewalk removal and replacement shall be paid for at the contract unit price per square foot, which price will be full compensation for removal and disposal of sidewalk; preparing the subgrade; and placing, finishing, curing and protection of concrete, complete in place.

5.03 CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT.
The accepted quantities of curb and gutter removal and replacement shall be paid for at the Subcontract unit price per linear foot for the type specified, which price will be full compensation for removal and disposal of curb and gutter; preparing the subgrade; and placing, finishing, curing and protection of concrete, complete in place.

5.04 GRAVEL DRIVEWAY AND GRAVEL AREA REMOVAL AND REPLACEMENT
The accepted quantities of gravel driveway and gravel area removal and replacement shall be paid for at the Subcontract unit price per ton of crushed limestone, which price will be full compensation for preparing the subgrade and replacing the gravel, complete in place.

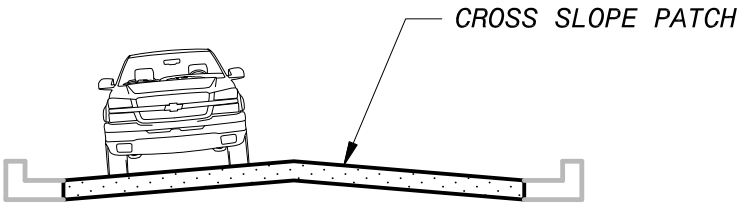
5.05 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
02950-01.01	Asphaltic Concrete Pavement Removal and Replacement	Cubic Yard

SECTION 02950 REMOVAL AND REPLACEMENT OF PAVEMENTS AND INCIDENTALS

02950-01.02	Concrete Pavement Removal and Replacement	Cubic Yard
02950-02	Concrete Sidewalk Removal and Replacement	Square Foot
02950-04	Concrete Curb And Gutter Removal and Replacement	Linear Foot
02950-06	Gravel Driveway And Gravel Area Removal and Replacement with Crushed Stone	Ton

END OF SECTION 02950



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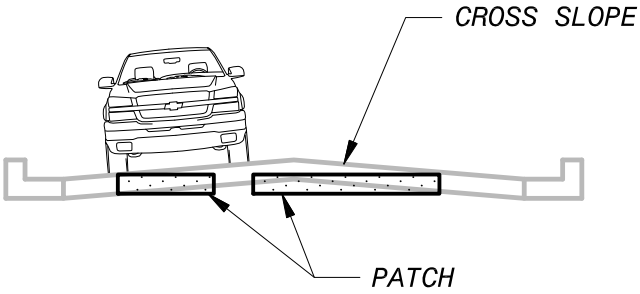


NOT ACCEPTABLE

NOTES

1. EXISTING PAVEMENTS SHALL BE REMOVED TO CLEAN, STRAIGHT LINES PARALLEL AND PERPENDICULAR TO THE FLOW OF TRAFFIC.
2. DO NOT CONSTRUCT PATCHES WITH ANGLED SIDES AND/OR IRREGULAR SHAPES.
3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. PATCHES SHALL HAVE A SMOOTH LONGITUDINAL GRADE CONSISTENT WITH THE EXISTING ROADWAY.
7. PATCHES SHALL ALSO HAVE A CROSS SLOPE OR CROSS SECTION CONSISTENT WITH THE DESIGN OF THE EXISTING ROADWAY.

MEMPHIS SEWER ASSESSMENT & REHABILITATION PROGRAM
SARP 10

BLACK & VEATCH
Building a world of difference.

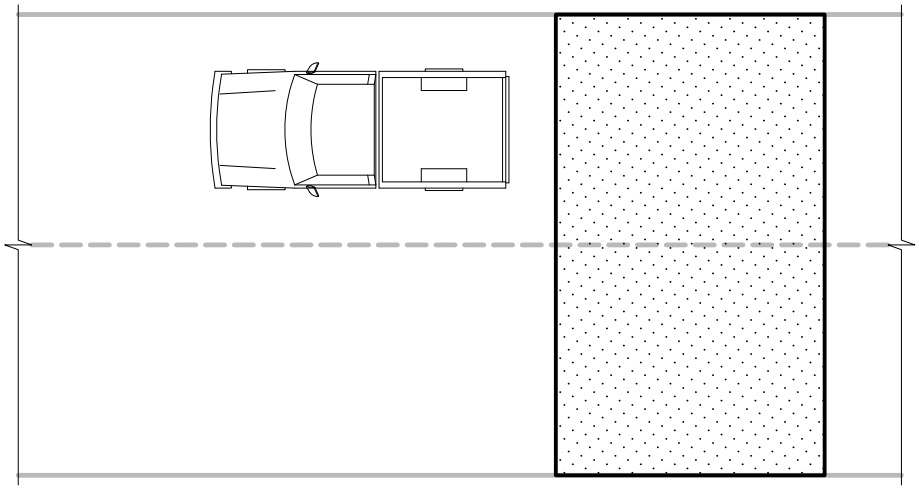
SARP10

PAVEMENT REPAIR CROSS SLOPE DETAILS

SCALE: NOT TO SCALE

REV 0.0

DATE: 04/04/14



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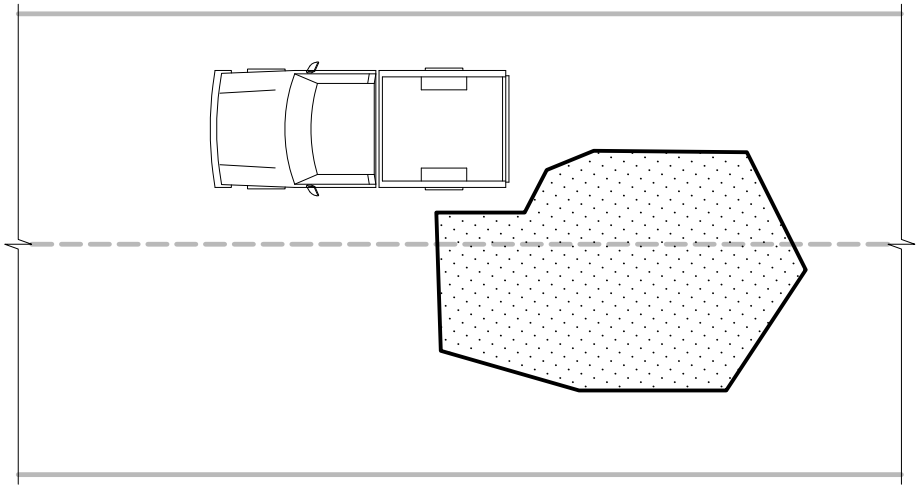

NOT ACCEPTABLE

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3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.

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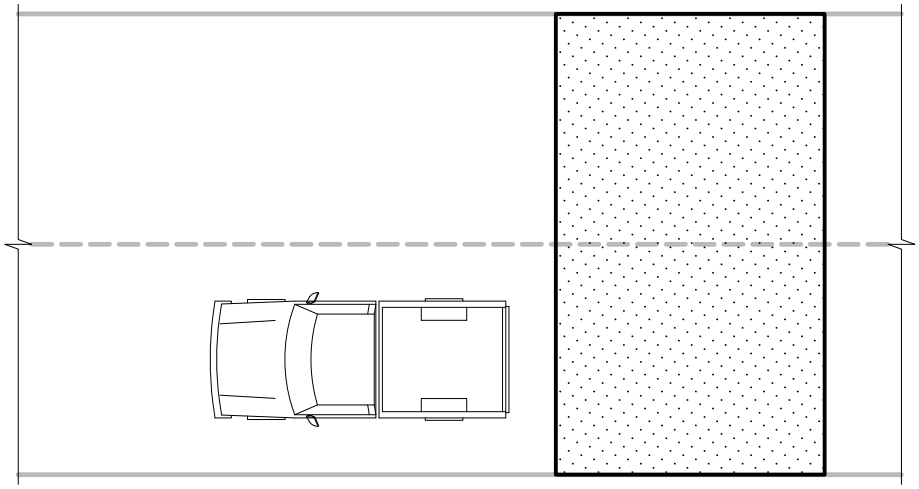
PAVEMENT REPAIR MULTI-LANE DETAILS

SCALE: NOT TO SCALE

REV 0.0

DATE: 04/04/14



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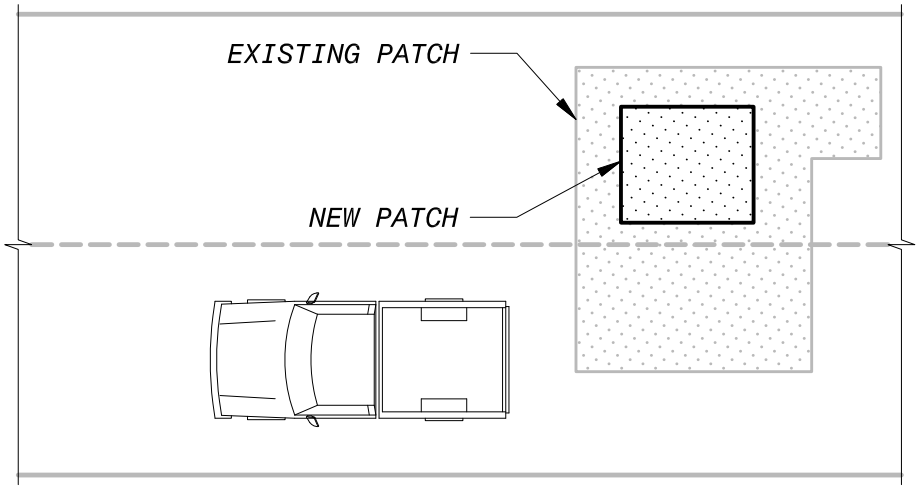

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3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. AVOID PATCHES WITHIN PATCHES. IF THIS CANNOT BE AVOIDED, MAKE THE BOUNDARIES OF THE PATCHES COINCIDE.

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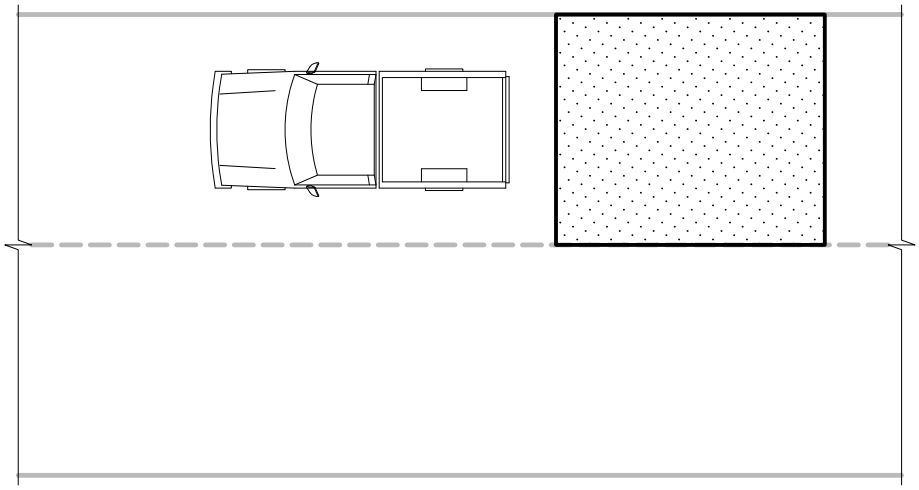
PAVEMENT REPAIR PATCH INSIDE A PATCH DETAILS

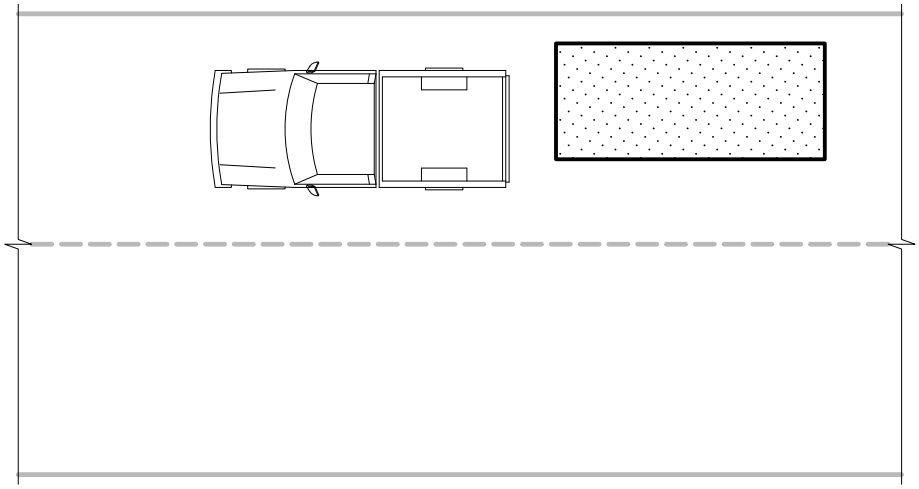
SCALE: NOT TO SCALE

REV 0.0

DATE: 04/04/14



ACCEPTABLE



NOT ACCEPTABLE

NOTES

1. EXISTING PAVEMENTS SHALL BE REMOVED TO CLEAN, STRAIGHT LINES PARALLEL AND PERPENDICULAR TO THE FLOW OF TRAFFIC.
2. DO NOT CONSTRUCT PATCHES WITH ANGLED SIDES AND/OR IRREGULAR SHAPES.
3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
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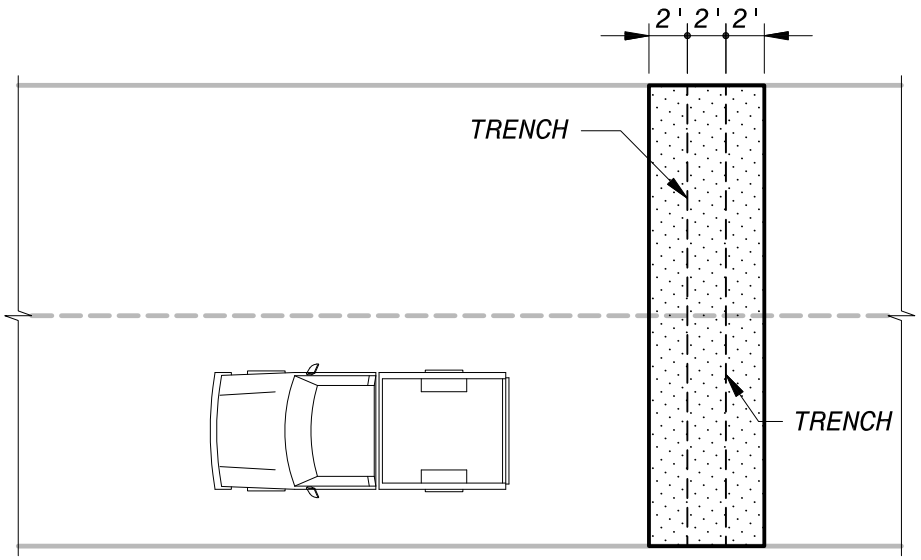
PAVEMENT REPAIR SINGLE LANE DETAILS

SCALE: NOT TO SCALE

REV 0.0

DATE: 04/04/14



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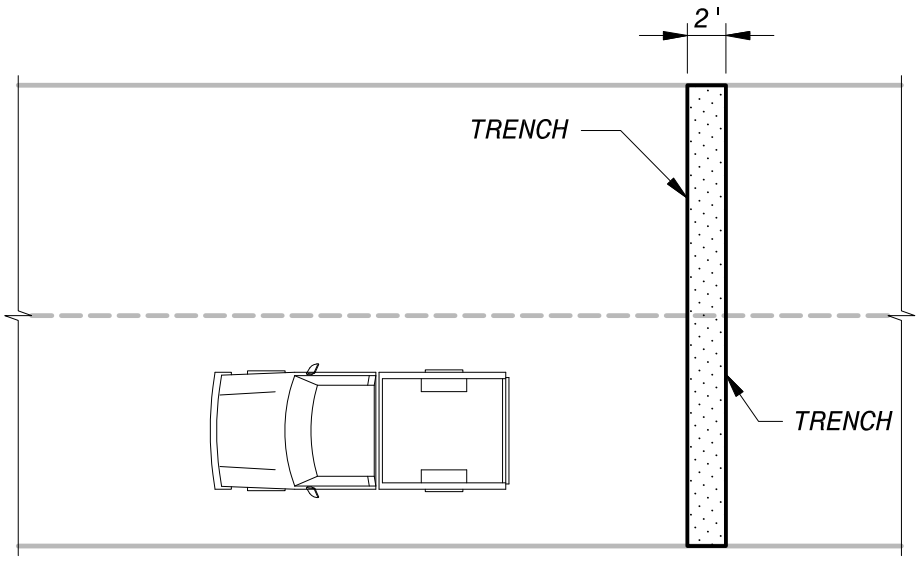

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5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. TRAVERSE PATCHES SHALL BE OVERLAID ACROSS THE ENTIRE STREET WIDTH FOR A DISTANCE OF TWO (2) FEET MINIMUM ON ALL SIDES OF THE TRENCH.

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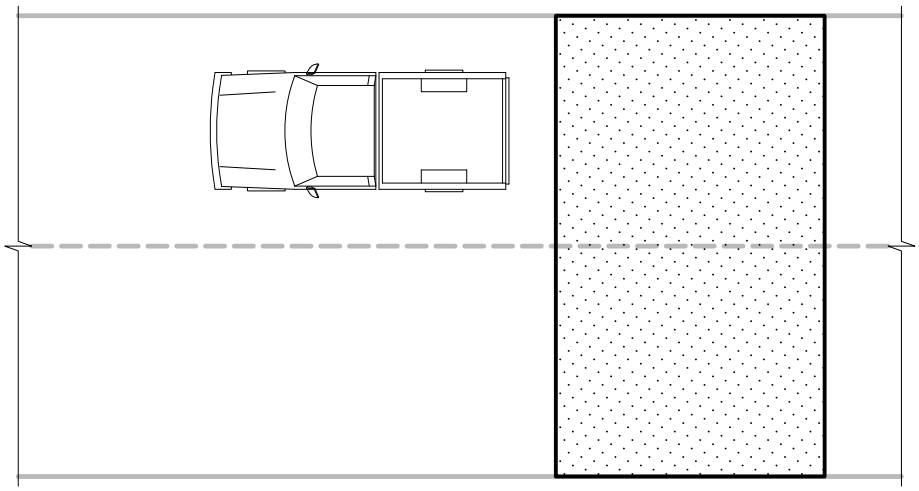
PAVEMENT REPAIR TRAVERSE PATCHES DETAILS

SCALE: NOT TO SCALE

REV 0.0

DATE: 04/04/14



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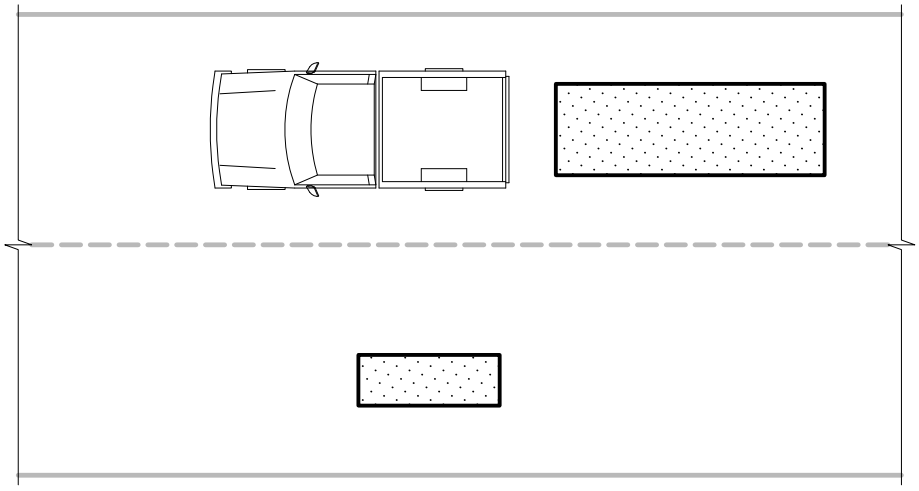

NOT ACCEPTABLE

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6. TRAVERSE PATCHES SHALL BE OVERLAID ACROSS THE ENTIRE STREET WIDTH FOR A DISTANCE OF TWO (2) FEET MINIMUM ON ALL SIDES OF THE TRENCH.
7. DO NOT ALLOW THE EDGES OF PATCHES TO FALL IN EXISTING WHEEL PATHS.
8. THE EDGES OF PATCHES PARALLEL TO THE DIRECTION OF TRAFFIC SHALL BE LIMITED TO THE BOUNDARIES OF LANES OR TO THE CENTERLINE OF TRAVEL LANES.

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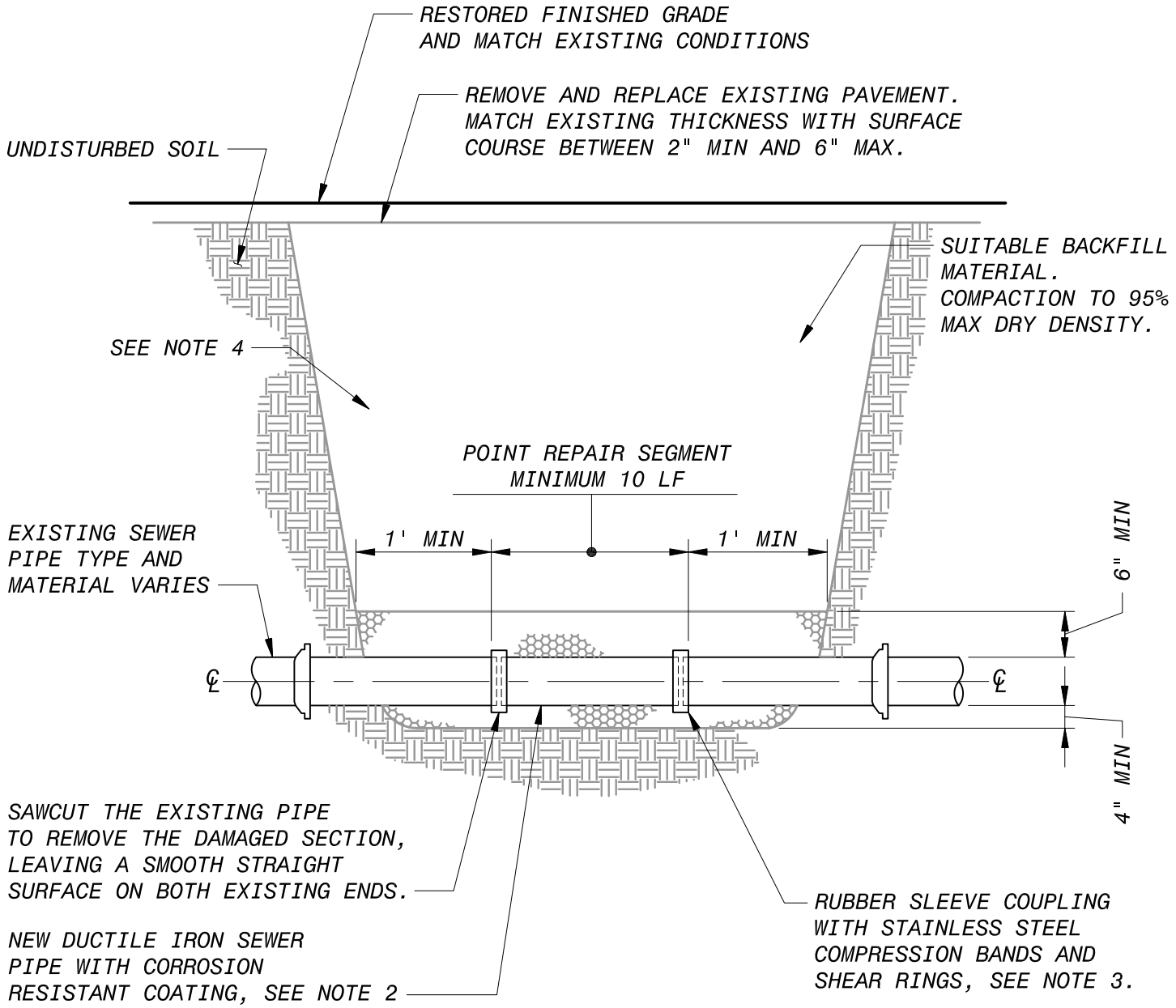
PAVEMENT REPAIR WHEEL PATH DETAILS

SCALE: NOT TO SCALE

REV 0.0

DATE: 04/04/14



NOTES

1. CONSULT WITH SARP10 CONSTRUCTION MANAGER BEFORE MAKING REPAIRS REQUIRING MORE THAN 10 LF.
2. INSTALL NEW DUCTILE IRON SEWER PIPE, IN ACCORDANCE WITH CITY OF MEMPHIS STANDARD CONSTRUCTION SPECIFICATION SECTION 02530-SEWER PIPE INSTALLATION.
3. INSTALL FERNCO SERIES 5000RC SHIELDED COUPLINGS WITH NUT AND BOLT CLAMP, MISSION "FLEX-SEAL" ADJUSTABLE SHIELDED REPAIR COUPLINGS, OR APPROVED EQUAL.
4. REMOVE EXCAVATED MATERIAL UNDER PAVED SURFACES AND BACKFILL WITH CRUSHED LIMESTONE OR RECYCLED CRUSHED CONCRETE PER CITY OF MEMPHIS STANDARD SPECIFICATIONS.

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SANITARY SEWER POINT REPAIR

SCALE: NOT TO SCALE

REV 3.0

DATE: 1/5/15

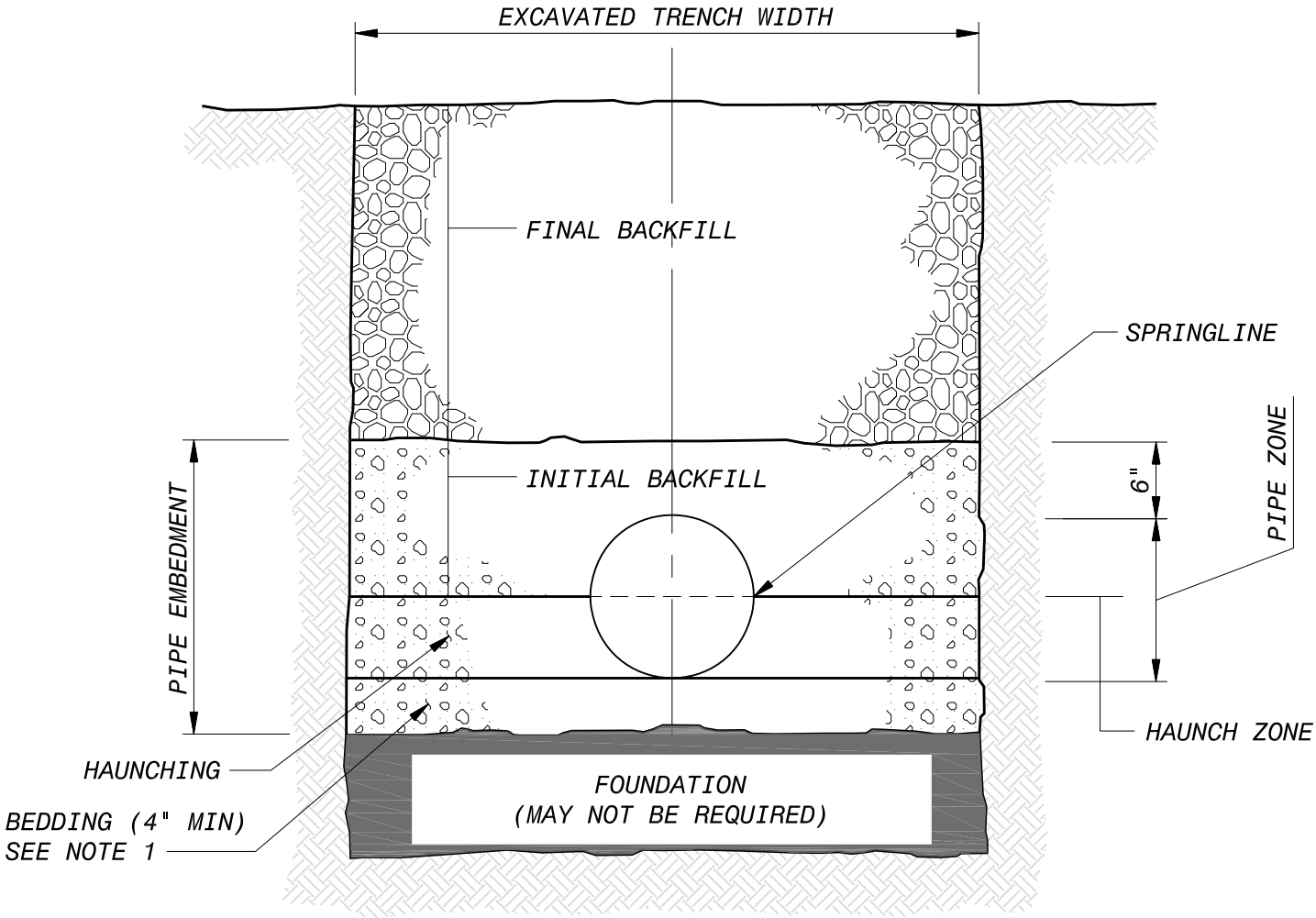

FIGURE 1

TRENCH CROSS SECTION SHOWING TERMINOLOGY

NOTES

1. INSTALL CRUSHED LIMESTONE ASTM D-448-54 TABLE 1, #67 FOR BEDDING AND HAUNCHING MATERIAL. THE QUANTITY OF CRUSHED LIMESTONE FOR BEDDING AND HAUNCHING IS PART OF THE "SEWER POINT REPAIR" LINE ITEM AND NO SEPARATE PAYMENT WILL BE MADE.
2. INSTALL EITHER CRUSHED LIMESTONE OR RECYCLED CRUSHED CONCRETE FOR INITIAL BACKFILL AND FINAL BACKFILL PER CITY OF MEMPHIS SPECIFICATIONS.

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TRENCH CROSS SECTION SHOWING TERMINOLOGY

SCALE: NOT TO SCALE

REV 0.0

DATE: 1/5/15