

**SAGINAW COUNTY ROAD COMMISSION**  
3020 Sheridan Avenue  
Saginaw, Michigan 48601

**NOTICE TO BIDDERS**

Sealed proposals will be received by the Board of County Road Commissioners of Saginaw County, Michigan, at their office at 3020 Sheridan Avenue, Saginaw, Michigan, 48601, until 10:00 a.m., Monday, March 15th, 2010, at which time and place bids will be publicly opened and read for the purpose of furnishing one (1) years supply of the following items:

**Portable Video Inspection Unit**

All proposals must be returned in sealed envelopes, plainly **marked as to bid items** and bear name of bidder. **ONE BID, PER ITEM, PER ENVELOPE.**

The Commission reserves the right to reject any or all proposals or any part of same; to waive irregularities and/or informalities and to accept any proposal considered to be in the best interest of the County of Saginaw.

**BOARD OF COUNTY ROAD COMMISSIONERS OF SAGINAW COUNTY, MICHIGAN**

John D. Sangster, Chairman  
Richard F. Mallette, Vice Chairman  
Wallace J. Warner, Member  
Richard H. Crannell, P.E., Member  
Todd M. Hare, Member

# Bid Proposal

## PORTABLE VIDEO INSEPTION UNIT WITH STEERABLE MOTORIZED CRAWLER AND CAMERA

**PROPOSAL:** To be submitted by 10:00 A.M., Local Time, Monday March 15, 2010.

The Board of County Road Commissioners, of Saginaw County, Michigan, will receive Bids at their Offices at 3020 Sheridan Avenue, Saginaw, Michigan, 48601, at which time the bids shall be opened and read aloud. The undersigned proposes to furnish the following new equipment.

### **GENERAL:**

It is the purpose and intent of this proposal to describe a portable video inspection unit with zoom pan/tilt camera mounted on motorized crawler. Capable of inspecting 6" to 24" diameter pipes. The unit shall be of the manufacturers' current production model and the latest design, meeting or exceeding these specifications. All parts not specifically mentioned which are necessary to provide a complete unit shall be included.

### **PORTABLE TRANSPORT AND OPERATION MODULE:**

1. Portable unit shall be not larger than 42.24" D x 42.25 W x 46.50 H in order to easily mount in the bed of a pickup between the wheel wells or be mounted on smaller off road vehicle beds.  
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2. Portable unit shall have 4 steel lifting/tie-down rings at each corner to provide for lifting the system off of a vehicle and tying it down during transport and operation.  
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3. Transport unit exterior shall be made of 1/8" thick 3003 mill finish, Grade A aluminum.  
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4. Transport unit shall be able to be powered by a generator, inverter or inverter and battery combination.  
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5. Bottom of transport unit shall have dual 4" high aluminum skid lifts to allow for a fork lift to safely move the transport unit.  
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6. Transport unit exterior doors shall be constructed of 1/4" thick 3003 mill finish, Grade A aluminum and have a stainless steel, T-latch lock to secure cargo and prevent rust. The front door of the box will have two, 100 lbs. gas shocks to hold door open while operating camera equipment.

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7. All 3 door locks shall be keyed the same. \_\_\_\_\_

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8. Once the front door is open, it shall have two side sun shade blinds that are cotter pinned in a closed position for storage but easily move down to both sides of front door when being used. \_\_\_\_\_

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9. The transport unit front and both side doors shall be hinged with an aluminum 3/8 piano style hinge. \_\_\_\_\_

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10. All doors will have a bulb seal weatherproof gasket to protect electronic components from water ingress. \_\_\_\_\_

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11. Transport unit sides shall have 3.5" venting holes to allow for cooling of components when in use and evaporation of residual moisture than can be left within the unit after washing or using the camera equipment. \_\_\_\_\_

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12. Side doors shall be no larger than 14.5" wide and 20.75" high to allow for compact size but enough room to store the wash-down reel option or 2000 watt generator.

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13. Internally, the front or operator area of the transport box shall be separated into 3 areas: a cable reel area, an electronics rack mount area and a storage drawer area. \_\_\_\_\_

14. The electronic component area shall be a maximum of 22" x 28.5" tall x 22" deep to allow for monitor, control unit and DVD/VCR recording combo which shall be included in bid price. \_\_\_\_\_

15. Aluminum shelving shall have opening between all compartments to allow for easy wiring. \_\_\_\_\_

16. The drawer shall be an Accuride 500 lbs. Capacity slide-out style that can extend out to a length of 24". \_\_\_\_\_

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17. Drawer shall be foam lined and organized to easily store camera equipment and accessories. \_\_\_\_\_
18. Wash-down system shall be a 115 volt, 3.3 gpm @ 45 psi, Shurflo plump. An 11 gallon tank will be utilized and mounted at the rear of the box to serve as counterweight for the equipment \_\_\_\_\_
19. A removable cover for the wash down system shall be placed on the back side to facilitate maintenance of the wash down system. \_\_\_\_\_
20. A lockable access door shall be placed on the back cover to allow the user to drain the water tank without having to remove the entire cover. \_\_\_\_\_
21. Wash-down shall have a 50' x 3/8" retractable hose reel will be mounted in top right rear compartment of box to facilitate easy access while in the bed of a pickup truck. \_\_\_\_\_
22. Electrical system shall have a two panel fuse box with a 15 and 20 amp GFI protected breakers. A 110 volt flush mounted water proof receptacle shall be provided to supply power to the enclosure via a grounded extension cord. \_\_\_\_\_
23. Exterior of the box shall be painted in a silver IMRON paint. The interior will be painted with a flat, non-reflective black DTM finish. \_\_\_\_\_
24. The weight, fully loaded with equipment and water, shall not exceed 500 lbs. \_\_\_\_\_

**PORTABLE CAMERA CONTROL UNIT:**

1. Portable Camera Control Unit
  - a. The system controls must be contained in a damage resistant housing with flip down control lid, embedded keyboard and carrying handle. \_\_\_\_\_
  - b. The CCU shall include circuit protection for individual electronic components. This is to be incorporated in case of power interruption, surges, component malfunction or inadvertent mis-operation of the system.
  - c. Control unit must be available in configurations for complete portability with embedded color video monitor, rack mount in a vehicle installation and portable without monitor.

- d. Control unit not to weigh more than 30 lbs. \_\_\_\_\_
  - e. Control unit not to be larger than (21 w x 18 d x 6 h) inches.  
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  - f. Control unit to operate on 115V / 60W / 4 amps or 230V / 50W / 2 amps.
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g. The Camera Control Unit shall contain the following controls, inputs and outputs:

i. Inputs/Outputs (Mounted in front for portable systems and in rear for truck mount systems)

1. Portable system to have fold down cover with keyboard input \_\_\_\_\_
2. Video out BNC connector \_\_\_\_\_
3. RS232 for output of text and footage data to software \_\_\_\_\_
4. Hour meter \_\_\_\_\_
5. Red and green fuse indicator per slide out card \_\_\_\_\_
6. Control cable receptacle to cable reel \_\_\_\_\_
7. Keyboard for text generation \_\_\_\_\_
8. 90V – 240V universal AC power supply \_\_\_\_\_
9. External video BNC connector \_\_\_\_\_
10. Pendant control cable receptacle \_\_\_\_\_
11. External D connector for pendant and via pendant cable \_\_\_\_\_

ii. Controls

1. Power on/off switch \_\_\_\_\_

iii. Removable Pendant with controls

1. Size not be greater than — inches (6.25 L x 4.25 W x 1.5 D)

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2. Pendant to have keyway mechanism of docking to CCU

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3. Sealed membrane style buttons with LEDs

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4. Forward/Reverse, Left/Right tractor joystick control

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5. Rheostat Variable tractor speed control

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6. Camera pan and tilt joystick control

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7. Single click for normal Zoom IN/OUT

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8. Double Click same button for full IN/OUT Zoom position

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9. Hold down for longer than 1.5 sec for fast zoom IN/OUT

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10. Shutter speed button for Up, Down, and Auto

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11. Focus button for far, near and auto

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12. Button for centering pan and tilt to center forward position

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13. Double click home button to set wide zoom setting

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14. Joystick control of pan and tilt

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15. Rheostat control of lighting \_\_\_\_\_

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16. Rear view camera toggle button \_\_\_\_\_

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17. Laser measurement on/off button \_\_\_\_\_

18. 8' pendant control cable \_\_\_\_\_

- h. The proposed system shall have all electronic controls for the CCU mounted on modular slide out cards for easy repair/replacement. \_\_\_\_\_
- i. The CCU shall operate larger or smaller crawlers with no need for additional control unit or cable upgrades \_\_\_\_\_
- j. The CCU shall operate minimum 4", 5.5" and 9" ID crawlers without modification or adjustment to the cable, control unit or any other part of the system. \_\_\_\_\_
- k. CCU must have 5 slide out cards which can be removed from the control unit with a single screw:
  - i. Slide out video card \_\_\_\_\_
  - ii. Slide out text generator card \_\_\_\_\_
  - iii. Slide out 12v power card \_\_\_\_\_
  - iv. Slide out main power card \_\_\_\_\_
  - v. Slide out camera card \_\_\_\_\_

Control unit must have DVSS (digital visual sidewall scanning) camera compatibility. \_\_\_\_\_

## 2. Text Generator

- a. The system shall include a video text generator capable of displaying alphanumeric text material directly onto the video monitor. The facility for this data shall remain in memory when the unit is turned off and must be retained without system use for a minimum of 30 days. \_\_\_\_\_
- b. The videotext generator shall supply at least seven separate screen page memories for text storage and display. \_\_\_\_\_
- c. Screen page memories must be selected by no more than 2 keystrokes at any time during the inspection. \_\_\_\_\_
- d. Each screen page memory shall contain a minimum capacity of 32 characters across by 20 lines down, allowing for flexibility in formatting footage, date, time, job descriptions, defect codes, etc. In any location desired. \_\_\_\_\_
- e. Characters generated by the video text generator shall be available in the following formats and shall be accessed during any inspection by means of no more than 2 key strokes:
  - i. Black on video \_\_\_\_\_

- ii. Black on white background\_\_\_\_\_
- iii. White on video\_\_\_\_\_
  
- iv. White on black background \_\_\_\_\_
  
- f. Footage of cable extended shall appear upon the screen in conjunction with the cable counter. Reset or preset of the footage count shall also be possible by use of the videotext generator. \_\_\_\_\_
- g. Time and date shall be maintained by keypad and displayed on screen at any position selected by the operator. \_\_\_\_\_
- h. Date and time shall keep real time and remain in memory even when the unit is turned off. \_\_\_\_\_
- i. At least seven special fields shall be provided into which recurring information may be programmed and selected for entry onto the screen by no more than two keystrokes. These fields shall have a capacity of no less than 30 characters and shall be placed onto any screen page and any screen position selected by the operator. These special fields shall retain all information when the unit is turned off, for a minimum period of 30 days.  
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- j. A "Help" directory shall be provided and may be accessed, for monitor display. The "Help" directory will be permanently retained in memory and contain a short description of all text writing operations. \_\_\_\_\_
- k. A keypad shall provide all letters, number, punctuation marks and signals found on QWERTY keyboard. In addition, arrows pointing UP, DOWN, RIGHT, and LEFT shall be provided by the character set. \_\_\_\_\_

**STEERABLE MOTORIZED CRAWLER:**

1. The system shall include a gear driven; six wheel drive tractor to carry the camera for rapid remote inspection of pipes ranging from 6" to 24" diameter. All wheels must overlap each other in 8" dia. Pipes or larger to maintain a constant foot print for crawling over debris and offsets. Crawlers having to remove center wheels or having spaces between wheels for diameters above 6" will be deemed unacceptable. \_\_\_\_\_
2. Crawler must have NRTL approval for IP68 (IEC60529) or NEMA 6P (NEMA250) enclosure type ratings to offer protection for the operator and equipment in wet and damp environments. \_\_\_\_\_

3. The crawler shall have forward/reverse and left/right steerable movement via the pendant control on the CCU. The tractor must allow for forward/reverse and left/right steerable movement to happen simultaneously to increase productivity. Tractors that have to stop forward/reverse movement to steer shall be deemed unacceptable. \_\_\_\_\_
4. The tractor shall provide sufficient traction, under suitable conditions, to tow 660 feet of transmission cable. Such traction shall be provided by six gear driven wheels with tapered tires. \_\_\_\_\_
5. Crawler will have triple seal water ingress protection for electronic components. All axles are individually sealed, side plate is sealed and electronic/motor compartment is additionally internally sealed from gear/axle compartment. Crawlers which do not protect electronics from gear train internally will be deemed unacceptable. \_\_\_\_\_
6. Crawler must have no more than a single sealed access point between worm drive and outer gears that drive both the left and right side of the 6 wheel drive feature. \_\_\_\_\_

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7. All axles must use sealed bearing cups for smooth and efficient rotation of 6 wheel drive mechanism. \_\_\_\_\_
8. All axel drive gears for the 6 wheel drive mechanism to be made of stainless steel. Gears made of other materials are unacceptable. \_\_\_\_\_
9. Both the camera and cable shall be easily removed from the tractor unit with a T-bar tool to facilitate productivity and service. This connector shall have a lifetime warranty. T-bar tool turns a cam lock no more than 2" to secure and release the cable or camera. Single connection in crawler rear is sufficient to operate all standard and additional cameras and lighting without the need for additional wires or cables. Systems with any form of extra cabling for 8" pipe diameter configuration will be deemed unacceptable. \_\_\_\_\_
10. The tractor shall have a maximum size of 3" wide by less than 4" high. To allow for proper clearance in 6" and lined pipes. \_\_\_\_\_
11. Front bottom edge of crawler shall be solid anodized aluminum and be curved upward to assist with moving over and through common debris and obstacles. \_\_\_\_\_

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12. To increase performance in soft sediment and debris and ease of use the tractor shall weigh a maximum of 19.5 lbs with pan tilt zoom camera. \_\_\_\_\_
13. To improve versatility for other applications, accessories can be added to the crawler that enhances inspection performance, the total weight of these accessories, crawler and zoom camera to be 40 lbs. \_\_\_\_\_

14.2 —20 watt DC motors shall power the tractor \_\_\_\_\_

15. The tractor shall be no longer than 16.5" with the pan/tilt/zoom camera in order to easily navigate through 90 — degree inverts without rolling. \_\_\_\_\_

16. The tractor shall allow for forward view camera to be fully enclosed (not sticking out in front of crawler) to provide for added durability and short overall length for maneuverability. \_\_\_\_\_

17. In order to prevent leaking and bending due to torque and stress generated by a small steerable crawler, the tractor chassis shall be a single piece of machined aluminum with only a top plate to access the control boards, a bottom plate to access the motors and two zinc plated brass side cover plates to access the gears. Tractor body constructed out of brass/bronze will be deemed unacceptable. \_\_\_\_\_

18. All wheels to have tapered edges to conform to pipe sidewall. \_\_\_\_\_

19. 8" configuration grease wheel set to position crawler by being 3" up the side wall of the left and right side of the pipe from the bottom center and provide no less than a 1" area for pipe sidewall traction. Crawlers that sit in the bottom of the pipe and flow and do not meet this standard will be deemed unacceptable. \_\_\_\_\_

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20. The tractor shall have removable machined key fitting on all 6 axles to facilitate easy use, ensure an exact fit with all wheels and avoid possible axle replacement due to wear. \_\_\_\_\_

21. The tractor shall include 7 sets of wheels and spacers suitable to accommodate pipe inspection in 6" through 24" pipes. Spacers and wheels sizes shall attach with a single hex head bolt. \_\_\_\_\_

22. Tractor shall work with the following standard wheels. Wheels I, ii, iv, and iv + v, must center camera in 6", 8", 10" and 12" dia. pipe without need for raising camera. \_\_\_\_\_

a. Included:

i. (6) 3.33" diameter rubber wheels \_\_\_\_\_

ii. (4) 4.33" diameter grooved rubber wheels \_\_\_\_\_

iii. (4) 4.33" diameter soft composite grease wheels with traction grit impregnation \_\_\_\_\_

iv. (4) 5.31" diameter grooved rubber wheels \_\_\_\_\_

v. (6) 1" stainless steel width spacers \_\_\_\_\_

23. Auxiliary low profile tri-LED performance shall be no less than 7100 Lux at 1', 1500 Lux at 5' and 900 Lux at 10' in combination with pan-tilt-zoom camera as measured by a calibrated light meter in a 8" diameter pipe. \_\_\_\_\_
24. Low profile auxiliary light have NRTL approval for IP68 (IEC60529) or NEMA 6P (NEMA250) enclosure type ratings to offer protection for the operator and equipment in wet and damp environments. \_\_\_\_\_
25. Crawler must have low profile integral (not an attachment) SONDE with no greater than 4 mm raised profile for signal transmission. \_\_\_\_\_
26. Crawler must allow for operating the rear viewing camera attached. Rear view camera to be centered no lower than 6.5" from the center bottom of pipe in this configuration. \_\_\_\_\_
27. Tractor must have two mechanical screw mounts 20 mm apart to solidly adhere lighting and rear view camera. Hose clamps/clips or non hex head bolt attachment will not be acceptable. \_\_\_\_\_
28. Crawler must fit in 8" diameter pipe with rear viewing camera attached. Rear view camera to be centered no lower than 6.5" from the center bottom of pipe in the configuration. \_\_\_\_\_
29. The tractor shall have a visible internal pressure indicator on the tractor allowing the operator to detect a pressure loss. The internal pressure indicator must be on at all times showing a solid green light for safe range pressure (8 to 10 pounds), solid red for over pressure (over 10 pounds), and flashing red for under pressure (under 5 pounds). \_\_\_\_\_
30. Pressure indicator LED is protected by a 3/4" waterproof stainless Hex with sapphire window. \_\_\_\_\_
31. Dry pressurized air to be added via a rear shraeder valve after a repair or due to pressure loss that occurs during ordinary use. Valve is centered under rear connector to protect it from being damaged and is secured with stainless hex nut.  
\_\_\_\_\_
32. The tractor shall have a tilting rear cable connector that points vertically when deploying the system into a manhole but can tilt into a horizontal position during operation in order to protect cable and connector out of solid aluminum and stainless steel and shall not have any electrical components other than wiring and connectors. \_\_\_\_\_

33. The tractor shall have a strain relief system for the cable that is comprised of (2) high strength steel cables and an aluminum capture device to secure to cable brass fitting. \_\_\_\_\_
34. The rear tractor cable connector shall have a machined mechanical cable connector that captures four stainless points and positively locks the cable to the crawler body without damage to the cable or connectors. \_\_\_\_\_
35. Crawler and cable stainless connectors must have a lifetime warranty. \_\_\_\_\_
36. The tractor shall allow for camera riser kits to allow for the manual lift of the camera above the crawler for better centering in pipe diameters from 12" to 24" capability and to view in high water level/flow conditions. \_\_\_\_\_
- a. Adjustable camera raise kit must lift the camera lens center no less than 12" above a flat surface in a 12" pipe diameter configuration. \_\_\_\_\_
  - b. Hardware to raise camera must also include hardware to secure and equally raise the auxiliary lighting and rearview camera. \_\_\_\_\_
  - c. Adjustable camera raise kit must have single cam lock lever to secure desired camera position. \_\_\_\_\_
37. Tractor must be compatible with static 2" and 5" camera riser kits. \_\_\_\_\_
38. The tractor must have an integral inclinometer as standard for tracking and electronically outputting pipe rise and fall (grade) and integrate data with database inspection software. Tractors without a standard inclinometer will be deemed unacceptable. \_\_\_\_\_
39. To preserve the value of this investment for the future, tractor must have the ability to be upgraded without modification to the tractor, control unit or cable. Following technologies must be presently available:
- a. Digital Scanning capability/ DigiSewer \_\_\_\_\_
  - b. Front camera mounted Laser Profiler \_\_\_\_\_
40. 60% or more of the entire length of any camera must be protected and housed within the crawler to prevent pressure and damage on front camera connection point and to keep even balancing when inserting the crawler into a manhole or basin. Cameras that protrude past the tractor body more than 3 inches will be deemed unacceptable. \_\_\_\_\_
41. To assist with crawler traction and minimize cable resistance, crawler unit must come with down hole roller weighing no more than 7.3 lbs, with 4 Delrin 2" diameter low friction cable guide rollers enclosed in a heavy duty articulated aluminum bracket, can be lowered with 40 ft of rope (included) and Manhole Roller for cable management. Pole systems or tiger tail/hose protection will be deemed unacceptable. \_\_\_\_\_

**ZOOMING PAN/TILT COLOR CAMERA:**

1. Camera must have NRTL approval for IP68 (IEC60529) or NEMA 6P (NEMA250) enclosure type to offer protection to the operator and equipment in wet and damp environments. \_\_\_\_\_
2. The pan & tilt camera must connect directly to the cable, and 3 different size crawlers (4" pipe diameter to 60" pipe diameter capability) without modification to the cable, control unit or any part of the system. \_\_\_\_\_
3. When connected to any crawler there cannot be external wires, connectors, clamps or tie-downs. \_\_\_\_\_
4. The camera will pan (+/- 175 degrees) and tilt (+/- 135 degrees) allowing for full view of laterals and joints. \_\_\_\_\_
5. Camera will have the ability to view behind crawlers to inspect upstream lateral rubber seal on gravity flow PVC pipes. \_\_\_\_\_
6. Pan and tilt will have mechanical stops to avoid slip-ring maintenance issues and prevent camera from inadvertently being positioned into dirty flow at bottom of pipe. \_\_\_\_\_
7. Camera must have 10X optical and 4X digital zoom capability for viewing up laterals and magnifying observations. \_\_\_\_\_
8. Camera construction shall include all solid — state circuitry designed to withstand shocks and vibrations while being pushed, pulled or propelled through the pipe. \_\_\_\_\_

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9. All camera electronics shall be of modular construction for ease of exchange and repair, and shall be designed to facilitate future upgrades. \_\_\_\_\_
10. The front of the camera housing shall have a windshield made of sapphire distortion-free material. The windshield shall be field replaceable by a single tool. Multiple tools or removal of several parts shall be deemed unacceptable. \_\_\_\_\_
11. The housing shall be fully sealed and waterproof (IP68) to withstand external pressure up to 15 psi without damage or leaking. \_\_\_\_\_
12. The camera power supply shall be provided from a solid — state power source and the camera input shall be 12 volts DC. The lighting for the camera shall be supplied through an isolated power supply and shall regulate the light voltage up to a nominal 36 volts DC. \_\_\_\_\_
13. Pan/Tilt Motor power 12 V/3Watt. \_\_\_\_\_

14. The camera shall be designed for easy removal and installation from the cable or tractor by using a single T-bar tool to keyed stainless steel waterproof swivel loc-tite camera and cable connections. \_\_\_\_\_

15. Camera illumination must be provided with a minimum of 28 field-replaceable LED's that have a 50 degree lighting angle. LED housing shall be of stainless steel, with six high strength windows that can be replaced individually.

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16. Camera must be able to allow for direct front mounting of laser profile accessory for pipe diameters between 6" to 60". \_\_\_\_\_

17. The camera shall have a visible internal pressure indicator allowing the operator to detect a pressure loss. The internal pressure indicator must be on at all times showing a solid red light for over-pressurized (over 10 pounds), green light for safe range pressure (8 to 10 pounds), and a flashing red light for under pressure (under 5 pounds). \_\_\_\_\_

18. Camera shall have Shraeder valve for purge and pressurization of camera-body. Pressurization prevents the ingress of water during an accident and provides a dry air internal environment to prevent fogging of inner lens during changing external temperatures. \_\_\_\_\_

19. Camera will pan and tilt at the same time to increase speed of inspection and home position placement when continuing forward. \_\_\_\_\_

20. Camera must not weigh more than 3.75 lbs. \_\_\_\_\_

21. Side stainless plates must be a minimum or 13 mm for increased durability when inserting the camera in a manhole. \_\_\_\_\_

22. Rotation axle must be made of a minimum of 15 mm stainless steel. \_\_\_\_\_

23. Following camera functions must be able to be controlled from the operator's studio as well as at the rear of the truck via a remote pendant:

- a. Single click for normal zoom IN/OUT. \_\_\_\_\_
- b. Double-click same button for full IN/OUT zoom position. \_\_\_\_\_
- c. Hold down for longer than 1.5 sec for fast zoom IN/OUT. \_\_\_\_\_
- d. Shutter speed button for up, down and auto. \_\_\_\_\_
- e. Focus button for far, near and auto. \_\_\_\_\_
- f. Button for centering pan and tilt to center forward position. \_\_\_\_\_
- g. Double click home button to set wide zoom setting. \_\_\_\_\_
- h. Joystick control of pan and tilt. \_\_\_\_\_
- i. Rheostat control of lighting. \_\_\_\_\_

24. Pan and tilt must have integrated clutch for pan and tilt motor. \_\_\_\_\_

**LIGHTWEIGHT 200 M CRAWLER TRANSMISSION CABLE:**

1. Minimum of 660 feet of continuous length multi-conductor cable shall be provided. The cable must be Kevlar reinforced and have minimum break strength of 500 lbs. single conductor cable will be deemed unacceptable. \_\_\_\_\_
2. The cable shall be no greater than .27 inches in diameter. \_\_\_\_\_
3. The cable must weigh more than 15 pounds per 328 feet. \_\_\_\_\_
4. A connector strain relief fixture must be provided to fit the cable and work with steel strain relief on the crawler side. \_\_\_\_\_
5. The cable must be able to connect to the following directly without any modification:
  - a. Color pan and tilt camera. \_\_\_\_\_
  - b. Axial forward-view color camera. \_\_\_\_\_
  - c. Pan, Tilt, and 40:1 zoom color camera. \_\_\_\_\_
  - d. Color digital scanning camera / DigiSewer. \_\_\_\_\_
6. Cable must be able to be removed from cable reel without tools, single electrical connector for easy replacement. \_\_\_\_\_
7. Cable must have tough outer jacket to resist tears and scrapes. \_\_\_\_\_
8. Outer jacket must be smooth to reduce friction. \_\_\_\_\_
9. Crawler connect end must have a minimum of 8" steel armored jacket to prevent cable damage while going around pipe bends and during entry. \_\_\_\_\_
10. Crawler connect end must have solid stainless steel bayonet style connector that locks with a single quarter turn with lifetime warranty. \_\_\_\_\_
11. Crawler connect end must have connector that has electrical keyway for proper alignment of cable to camera or crawler connector without damaging electrical pins. \_\_\_\_\_
12. Crawler/Camera end of cable must be minimum 12mm stainless wall thickness with minimum 2mm points to mechanically secure to crawler or camera connector. \_\_\_\_\_
13. Cable must be able to be directly re-terminated without the need for epoxy. \_\_\_\_\_

14. Cable must have easy single twist style connector for tool-less and easy connection to the following available cable drums: fully automatic cable reel, manual cable reel and cable reel with auto-assist motors for easy management.

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**MOTORIZED AUTO-SENSING CABLE DRUM:**

1. A cable drum shall be provided to contain the cable for camera and crawler operation. \_\_\_\_\_
2. The hub of the cable drum shall be equipped with a continuous contact slip-ring assembly to allow the cable to be dispensed and retrieved while the camera and tractor are operational. \_\_\_\_\_
3. The slip ring contacts shall be of an alloy of gold and rhodium and must be housed in an environmentally sealed housing. \_\_\_\_\_
4. Cable connector to slip ring housing shall have a hand tight locking mechanism with right angled molded plug to avoid water ingress. \_\_\_\_\_
5. Cable reel shall have a bottom tray that enables the reel to be easily removed for remote inspections. \_\_\_\_\_
6. Cable feed out and retrieval must happen automatically via a motorized system with sensors that operate the cable drum at the exact speed and direction of the crawler. Cable drums without automatic speed, cable feed out and retrieval shall be deemed unacceptable. \_\_\_\_\_
7. Cable reel shall have a maximum feed out of cable at 72 fpm and a maximum feed in of cable at 90 fpm. \_\_\_\_\_
8. Cable reel shall be capable of internally adjusting the rate of feed in/feed out by a trained technician, feed in 30-90 fpm, feed out 30-72 fpm. \_\_\_\_\_
9. Cable reel must have a level wind system which is neatly rolls and stores cable without excessive loops or tangling. \_\_\_\_\_
10. Cable shall be wound on plastic drum, inner diameter 6", outer diameter 16" and width 7.75". \_\_\_\_\_
11. Cable reel level wind mechanism must have protection from weather by rubber gaiters. \_\_\_\_\_
12. The cable drum must have a red lighted emergency stop switch. \_\_\_\_\_

13. The cable drum must have a normal and inverse switch which allows the crawler controls to be used normally if the crawler has to flip and be operated in an upside down position. \_\_\_\_\_
14. The cable drum must be able to operate in both automatic and manual modes. Cable drums that operate in only the manual mode and retrieve the tractor in free wheel will be deemed unacceptable. \_\_\_\_\_
15. System must have back-up manual crank arm in case of power loss. \_\_\_\_\_
16. Front panel must have LCD readout of footage. \_\_\_\_\_
17. \_\_\_\_\_  
System must have outward cable rolling arm to help with pressures of cable when crawler is being reversed and for allowing for easy deployment when crawler is moving forward. Roller and arms must be able to be stored in an upright position when not in use of facilitate portability. \_\_\_\_\_
18. The cable drum must have speed and torque rheostat controls to adjust for different pipe conditions and user preferences. Speed only controls shall be deemed unacceptable. \_\_\_\_\_
19. The cable reel shall not weigh more than 95 lbs and of aluminum construction, with 660 feet of cable. Cable reels that do not meet this will be deemed unacceptable. \_\_\_\_\_

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20. Cable reel system must come with 20' control cable to control unit and have ability to work with a 165 foot extension cable. \_\_\_\_\_
21. The system shall include a footage counter attached to the counter arm assembly which extends from the cable drum. \_\_\_\_\_
22. The footage counter assembly shall be constructed of machined aluminum parts and shall include the necessary guide wheels to maintain cable tension. \_\_\_\_\_

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23. The footage counter shall measure passage of the cable from the wheel graduated in 0.1-foot steps. \_\_\_\_\_
24. The footage counter shall function electronically and transmit footage data for monitor display and video recording. \_\_\_\_\_
25. Size of cable drum must not be greater than 14" x 21" x 20" (W x L x H). \_\_\_\_\_

26. Cable drum chassis shall be constructed of aluminum with the sub frame made of stock 20mm aluminum, assembled with M2.5 x 10 bolts. \_\_\_\_\_
27. Cable drum has side and front panels made of 2.0 mm thick aluminum for protection of electro/mechanical parts from weather and as safety for operators against moving parts. \_\_\_\_\_
28. Chain drive must have plastic guard for operator safety. \_\_\_\_\_
29. Power supply must be mounted in a sealed aluminum housing and have a UL listing (UL E183223) for safe operation, with input of 110/230 Vac. \_\_\_\_\_
30. Cable reel shall have no exposed or internal only rated plugs/sockets or connectors, that could endanger operator safety. \_\_\_\_\_
31. Cable reel motor shall be rated at 24 Vdc, 8.4 A and 200 W. \_\_\_\_\_
32. Cable reel motor and control board shall be housed in a sealed aluminum enclosure 5" diameter x 16" long. \_\_\_\_\_
33. Cable reel motor must have magnetic clutch to engage when the 'stop' position is selected on the control panel. \_\_\_\_\_
34. Cable drum not to pull more than 2 amps at 115 v. Cable drums pulling more than 2 amps will be deemed unacceptable. \_\_\_\_\_
35. Cable drum work with 3 steerable crawlers which allow for 4" to 60" pipe diameter capability. \_\_\_\_\_
36. Slip ring assembly shall have bearing housing attached, 3.5" outside diameter and 2 3/4" inside diameter. \_\_\_\_\_
37. Roller arms shall have center roller made of solid Delrin material, each end has a 1 1/2" housing with a inside diameter of 0.4 to fit an easy glide bearing cup to allow free movement of the roller during operation. \_\_\_\_\_

Successful bidder **MUST** furnish hands on training for Saginaw County Road Commission Employees, illustrated parts, operator and service manuals at the time of delivery

Bid **MUST** meet all Federal, State, and Local safety standards.

Bidder **MUST** use the bid form provided by the Saginaw County Road Commission.

Bidder **MUST** provide descriptive literature with their bid.

Bidder **MUST** indicate any deviations from specifications in spaces provided.

Bidder \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

Phone # \_\_\_\_\_

Model Bid \_\_\_\_\_

Delivery Date \_\_\_\_\_

Price \_\_\_\_\_

Signature \_\_\_\_\_

Exceptions \_\_\_\_\_