

## Detailed Specifications for Ascension Parish, LA

### 1 TV TRAILER - 16' TANDEM AXLE

Lights: Approved ICC light package  
GVW: Gross Vehicle Weight Rating - 10000 lb.

Miscellaneous:

- Full width rear doors
- Side entry door to viewing room
- Tandem axle
- Jack ram hoist and a 2-5/16" Adjustable coupler
- Four (4) Scissor Jacks

#### TV TRAILER DIMENSIONS:

Length - 16'  
Width - 8'

### 1 EVO 3.0 TRAILER CONTROL ROOM INTERIOR

#### EXTERIOR

The trailer shall include an amber LED warning beacon mounted on the roof.

Two adjustable 12V LED floodlights (work lights) shall be provided.

#### INTERIOR

The trailer interior shall be divided into two areas - an Operators Control Room and an Equipment/ Storage Room. A full width laminate covered bulkhead wall constructed with cabinet grade plywood with an operator pass through door will divide the two areas. The bulkhead wall will have a 3" aluminum kick plate (minimum 1/8" thick) attached at the base for protection from possible damage caused by impact.

#### TRAILER CONTROL ROOM

The Control Room shall be located at the front of the van body. All cabinets and hinged cabinet doors shall be constructed of 7ply cabinet grade plywood for durability. All cabinets will be mounted above the floor surface on 1/4" nylon spacers to minimize any potential water damage from absorption of water during the wash down process. A 3" aluminum kick plate (minimum 1/8" thick) will be installed at the base of all cabinets and walls to provide maximum protection against potential damage caused by impact or moisture. Cabinets not constructed of 7ply cabinet grade plywood shall be deemed unacceptable. All hinged cabinet doors will have a metal flush (recessed) mounted positive latch, eliminating the unwanted opening of doors during transit. Plastic door latches or surface mounted barrel bolt type latches shall be deemed unacceptable on any cabinet doors.

Cabinets installed directly on the floor surface without nylon spacers and cabinets constructed with particle/MDF board shall be deemed unacceptable due to the possibility of water damage. Cabinets installed with no 3" aluminum kick plate at the base shall be deemed unacceptable due to lack of protection from potential long term impact damage.

The Control Room floor shall be constructed of a 3/4" cabinet grade plywood substrate with 1/4" tall water relief channels attached to the bottom of the floor to prevent moisture from gathering under the floor, thus minimizing potential long term water damage. The plywood substrate shall be covered with Lonseal flooring. The Control Room walls and ceiling will be covered with a seamless Kemlite laminate. The Kemlite laminate on the walls and ceiling shall be void of any

seams or exposed screws for easy cleaning. Laminate wall and ceiling covering that is not void of seams and screws will be deemed unacceptable due to the difficulty of cleaning.

A plywood control console shall be used for mounting all electronic components. The control console shall be designed to bring all controls within comfortable reach of the operator. The control console shall be positioned so the operator can see the Equipment Room area through a tinted window in the bulkhead wall. The control console shall be equipped with 19" Industrial rack rails for the electronic components. A 1" thick counter top constructed with 7ply cabinet grade plywood shall be provided. The counter top shall be covered with an Industrial grade "standard" Laminate (.062" thick) for durability.

A 12V "high intensity" LED indirect light fixture shall be supplied for optimum lighting in the Control Room. Direct Lighting shall be deemed unacceptable due to the glare on the video monitor and track (halogen) Lighting shall be deemed unacceptable due to the heat produced from the bulbs.

(2) Duplex interior electrical outlet shall be supplied in the Control Room.

## **1 ROOF MOUNTED AIR CONDITIONER**

### **1 EVO 3.0 TRAILER EQUIPMENT ROOM INTERIOR**

#### **EQUIPMENT/ STORAGE ROOM**

The Equipment/Storage Room will be located in the rear of the trailer. The Equipment / Storage Room floor shall be constructed of 3/4" cabinet grade plywood substrate with 1/4" tall water relief channels attached to the bottom of the floor to prevent moisture from gathering under the floor, thus minimizing potential long term water damage. The plywood substrate shall be covered with Lonseal flooring. Aluminum diamond plate flooring shall be deemed unacceptable due to its poor wear characteristics, poor traction, and potential glare hazards from the sun. The side walls, rear doors, and ceiling shall be constructed of 3/8" plywood and covered with a protective washable Kemlite laminate. The Kemlite laminate on the walls and ceiling of the Equipment Room shall be void of any seams or exposed screws for easy cleaning. Laminate wall and ceiling covering that is not void of seams and screws will be deemed unacceptable due to the difficulty of cleaning.

The electrical system shall be designed to fully meet the environmental, safety, and electrical requirements of the vehicle as specified. All electronics will be housed in a climate-controlled cabinet.

A 12V "high intensity" LED indirect light fixture shall be supplied for optimum lighting in the Equipment Room. All Equipment Room electrical boxes, outlets, and wiring conduit will be UL approved for exterior use in a wet environment. One (1) duplex interior electrical outlet will be supplied in the Equipment Room area. No exposed wiring will be acceptable. All electrical wiring shall be in accordance with applicable electrical codes including NEC. An automatic transfer switch for Shore / Generator Power shall be installed and will be activated upon receipt of power with a minimum 40 second delay to protect all electronic components and assemblies.

Brackets shall be mounted on the passenger side rear door to hold all downhole poles, invert rollers and manhole adapter hooks when required.

### **1 20 GALLON WASHDOWN SYSTEM WITH RETRACTABLE HOSE REEL WITH 25' WATER HOSE AND NOZZLE**

A 20 gallon fresh water tank with a water pump to maintain water pressure for wash down of all

cameras, transporters, and other related equipment.

## **1 EQUIPMENT ROOM CABINETRY**

There shall be a workbench with a plywood worktop covered with Lonseal Lonplate flooring mounted on the passenger side (curbside) of the Equipment Room. A gooseneck faucet will be mounted on top of the plywood worktop for the sink. An upper storage cabinet will be mounted over the lower storage cabinet.

## **1 5-DRAWER TOOL CHEST, MODULINE**

### **1 32" COLOR FLATSCREEN MONITOR**

Shall be a high quality, ultra-thin, industrial grade color unit.

Shall be compatible with both NTSC and PAL signals; shall include an auto-detect function that has the ability to identify the signal that's being input and automatically switch from NTSC or PAL.

Shall have the ability to automatically monitor / adjust the video input and optimize the display settings without manual adjustments.

Shall include an On-screen Menu for adjusting monitor parameters. The menu shall include a user-friendly graphical interface to guide users through the customization of features and Individual preferences.

Shall operate from 120V AC or 230V AC power sources.

Shall be black in color with a metallic finish.

## **1 15 GALLON FUEL TANK**

### **1 GASOLINE GENERATOR W/ELECTRIC START - 7000 WATT**

The power source for the system will be a 7000-watt commercial grade alternating current gasoline powered EFI (Electronic Fuel Injection) generator consisting of the following:

#### **Generator**

Shall be an EFI (Electronic Fuel Injection) unit.

Shall be the product of a firm regularly engaged in the manufacture of gasoline powered generators.

Shall be designed for commercial mobile applications capable of handling the load of Intermittent heavy-duty use for sewerline television inspection units.

Shall be capable of continuously producing 7000 watts of power (58.3 amps) at 120 volts AC while rotating at 2880 RPM without undue heating, wear or vibration.

Shall be enclosed in a sound-attenuated housing and furnished with a 4-point mounting system with coil spring vibration isolators to ensure quiet operation.

Shall have an enclosed muffler for reduced noise and ease of installation.

Shall include self-diagnostic capabilities to simplify troubleshooting.

Shall include digital voltage regulation to ensure voltage stability as loads change.

Shall include overspeed/underspeed protection and low power factor field overcurrent protection.

Shall include an integral USDA Forest Service-approved spark-arrestor muffler.

Weight: 290 lbs.

Size: Length - 33.6 in, Width - 22.2 in, Height - 16.7 in

Sound level: 69dB(A) at 10 ft, typical installation, full load

#### **Engine**

Shall be an OHV, 4-cycle, 90 degree V-twin, two-cylinder gasoline unit developing at least 14

bhp.

Shall be designed to operate the generator at 60 cycles + or - 2 cps and shall be governor controlled to maintain these cycles under varying load conditions.

Shall be equipped with pressurized thru flow cooling system and an oil alert system to automatically shut off the engine to prevent damage when the oil level drops below the recommendation level.

Shall be equipped with electrical starting control (electronic ignition) for local and remote start/stop operation.

Power (max): gasoline fueled models: at 2880 r/min: 14 bhp

Ignition system: electronic magneto type with resistor plugs.

Fuel consumption: 1.22 gal/hr gasoline @ full load

## **1 POWER SUPPLY COMPONENTS**

A 30-amp external shore power receptacle shall be provided.

Shore power to generator switchover shall be accomplished through a UL approved automatic changeover switch with suitable time delay to avoid damaging power surges.

A 25 foot, 30 A shore power extension cable shall be supplied.

## **1 SYSTEM ENGINEERING PANEL**

The engineering panel shall provide monitoring of the power supply to the system. The panel circuitry shall be assembled in a rack-mounted chassis for installation in a built in control console. The faceplate shall be heavy gauge aluminum finished with an industrial grade surface and shall have permanent labels designating the function of the various switches and controls. Provisions shall be made on the panel for the following items:

AC Volt Readout

AC Frequency Readout (58-62 Hertz)

Generator Remote Start/Stop

Generator Run Time Readout

Flood Light Switch

## **1 PAN, TILT, and OPTICAL ZOOM LED CAMERA**

The Pan, Tilt, and Zoom Camera shall be designed for use in 6" diameter relined pipe and larger. The unit will be designed to provide close-up views of pipe walls during inspection including minute defects and voids. The unit will be color, shall operate optimally through a maximum of 4000' multi conductor or 2000' single conductor cable, and shall consist of the following (minimum):

Camera

Chassis construction shall include 100% solid state circuitry designed to withstand shocks and vibration normally sustained while being pulled through a pipe.

The camera module shall be an industrial model only.

**REPACKAGED CONSUMER GRADE CAMERAS (I.E. CAMCORDERS) WILL BE DEEMED UNACCEPTABLE FOR USE IN A PIPELINE TELEVISION INSPECTION SYSTEM.**

Operating temperature ranges of the camera shall be 0 degrees C to 50 degrees C.

**CAMERAS INCORPORATING BUILT IN LIGHTING SYSTEMS THAT GENERATE HEAT EXCEEDING THE OPERATING TEMPERATURE PARAMETERS LISTED BY THE BASE STOCK CAMERA MANUFACTURER WILL NOT BE ACCEPTABLE.**

The camera shall develop a true color and transmit a sharp image picture on the video bandwidths only.

**PICTURE TRANSMISSION SYSTEMS THAT REQUIRE THE USE OF R.F.**

SUPPRESSORS AND ARE SUBJECT TO LOCAL TRANSMITTER INTERFERENCE SHALL NOT QUALIFY AS BEING EQUAL.

Full color video bandwidths shall be provided with no sacrifice of low frequency response. There shall be no visible streaking of the low frequency test bars when viewing a standard EIA Test Chart.

Shall not exceed an overall length of 17.7", a head length of 6.6", and a camera barrel diameter of 3".

#### Camera Optical & Digital Zoom

Optical & digital zoom and zoom & focus speeds shall be selectable from the maintenance terminal.

Remote control of pan, tilt, pan and tilt homing, optical zoom, manual focus, automatic focus, shutter speed, frame integration, manual iris, diagnostics and internal lights shall be provided.

Optical Zoom Range: 10x

Digital Zoom Range: 4x (40x with optical zoom)

Total effective zoom ratio: 40:1

The lens shall be an automatic iris type with a manual override (controlled from the control console) to control the illumination range for an acceptable picture between 3 and 10,000 lux.

#### Pan and Rotate Speeds

Full Pan (no load): 56 deg/sec, full pan in 5-7 seconds

Full Rotation (no load): 31 deg/sec, full rotation in 11-13 seconds

#### Camera Housing

The camera mechanics and electronics shall be housed in a high strength, damage resistant, aluminum housing with a stainless steel tube.

The rear portion of the camera shall not exceed 3 inches in diameter to allow for operation in skids and self-propelled units that are designed for 3-inch diameter cameras.

The housing shall be 1/8" minimum wall thickness.

**HOUSINGS WITH THINNER STAINLESS STEEL WALLS OR ALUMINUM WALLS THAT EASILY DENT ON IMPACT WILL NOT BE CONSIDERED EQUAL.**

The front of the camera head housing shall have a view port of optical grade sapphire.

The rear of the housing shall have a recessed bell to protect the indexed cable connector.

#### Mounting Fork

The forward portion of the camera shall not exceed 4.5 inches in diameter and will include the mounting fork, camera head and lighting.

The camera forks must be rounded or chamfered and be the same diameter as the forward portion of the camera to eliminate any sharp corners that can become caught on obstructions.

**CAMERA FORKS THAT EXCEED THE DIAMETER OF THE CAMERA HOUSING THAT ARE SUBJECT TO DAMAGE INSIDE THE PIPE ARE NOT ACCEPTABLE.**

The mounting fork will rotate 360 degrees with an optical viewing angle of 400 degrees and shall allow the camera head to pan mechanically 285 degrees with a pan viewing angle of 331 degrees.

#### Camera Lighting

Shall be remotely controlled from the control console.

Shall be integrated into the camera and four 5 watt LEDs, equaling 20 watts

Shall provide adequate lighting in pipe sizes from 6" - 72"

Cameras that require external mounted non-directional lighting for 36" through 72" pipe are not acceptable.

## Electrical Specifications and Camera Requirements

### Video Output

Multi-Conductor Version: 1 V, S/N 46dB or greater

### Integrated Lights

Field Replaceable

Long Life LEDs containing (2) each 5 watt cluster LEDs

### Image Pick-up Device

Interline transfer 1/4 inch CCD color

### Picture Elements ( pixels)

Solid state 1/4" diagonal pixels: 768 (H) x 494 (V) = 379,392 elements (NTSC)

### Lens

10x Zoom f=4.2mm to 42mm (F1.8 to F2.9)

### Digital Zoom

4x (40x with optical zoom)

### Field of View

56° diagonal, 46° (H) wide, 4.6° (H) tele end

### Resolution Lines

470 TV lines horizontal

### Electronic Shutter

1/4 s to 1/10,000 s, 20 steps

### Minimum Illumination

3 lux @ F/1.4

### Input Camera Voltage

Single-Conductor Version: 64V to 160V

Multi-Conductor Version: 20-72V from controller

### Head Rotation

Axial Rotation: 360°

Rotation Optical Viewing Angle: 400°

Lateral Pan: 285°

Pan Viewing Angle Range: 331°

Operate in a 6" Relined Pipe

Rotational Diameter: 4½"

### Internal Diagnostics

Humidity sensor, CCD temperature, camera voltage, light head voltage, serial number identification, and operating hour meter.

**CAMERAS WITHOUT THE AFOREMENTIONED DIAGNOSTICS WILL BE DEEMED UNACCEPTABLE.**

### Working Pressure

50 PSI (minimum)

### Operating Temperature

0° to 50°C

### Compatible PCUs

Multi-conductor Version: 1208 Mainline PCU and Inspector General portable PCU

Single-Conductor Version: SC-2000 CCU

### Compatible Cables

Multi-Conductor Version: Up to 4000'

Single-Conductor Version: Up to 2000'

### Dimensions

Overall length: 17.7", Head length: 6.6", Body tube diameter: 3", Head rotational diameter, 4 ½"

### Weight

TBD

## **1 STEERABLE CAMERA TRANSPORTER, WHEELED, v2**

A self-propelled camera transporter shall be provided for inspecting relined pipe and storm drains/wastewater pipelines measuring 8" and up in diameter. The transporter assembly shall be designed to operate optimally with 1500' multi-conductor cable and shall consist of the following (minimum):

### **Transporter**

Shall include the following (minimum) equipment: (6) Driven Wheels, available in various sizes.

Shall operate through a minimum of (1500) feet of multi conductor video cable in suitable pipe conditions.

Shall include single point removal of wheels to quickly change configurations in different pipe sizes.

Shall include a two-speed transmission to optimize traction by doubling the torque in difficult pipe conditions or in larger diameter pipe.

There will be a protected manual shifter assembly on the transporter to facilitate quick gear ratio changes.

**CAMERA TRANSPORTERS WITH A ONE SPEED / GEAR RATIO TRANSMISSION SHALL NOT BE ACCEPTABLE DUE TO THE SUBSTANTIAL REDUCTION OF TORQUE / TRACTION PRODUCED WHEN LARGER DIAMETER WHEELS ARE USED.**

Shall have sufficient power and traction to inspect a minimum of (1000) feet from the manhole entry point in suitable pipe conditions.

Shall include a heavy-duty drive motor specifically designed to meet the power requirements of the system, regardless of size of pipe being inspected.

Shall be equipped with self-propelled power forward, power reverse, and free wheel capabilities.

Shall be constructed of brass, stainless steel, and aluminum alloy.

Shall have speed and direction controlled from the control console.

Shall be retrievable in the free wheel mode by the video cable reel to reduce the normal wear on the drive motor by 50%.

Shall have full, variable speed in power forward or power reverse modes.

The maximum speed for camera / transporter assemblies shall be 45 fpm in high gear for pipe configurations up to 15" and 65 fpm in low gear for pipe configurations up to 60".

**CAMERA / TRANSPORTER ASSEMBLIES INCAPABLE OF OPERATING AT THE SPECIFIED SPEEDS WILL BE DEEMED UNACCEPTABLE.**

Shall include an electrical connection for an external light source to ensure a clear picture in various pipe configurations.

The self-propelled camera carrier shall weigh a minimum of 50 lbs. without the camera in the 8" configuration and shall weigh no less than 90 lbs. in the 30" configuration.

The length of the transporter shall not exceed 22.6".

**TRANSPORTERS EXCEEDING 22.6" SHALL BE DEEMED UNACCEPTABLE.**

Shall include full proportional steering with the ability to conduct a complete 360 degree turn within its own radius.

### **Camera Compatibility**

Shall be designed to be compatible with pan and tilt, fixed view, straight line, and optical zoom pan and tilt cameras.

The transporter, when used with an optical zoom pan and tilt camera, shall fit into an 8" diameter relined pipe and will have the ability to operate in an 8" diameter pipe with offsets.

**ALL TRANSPORTER / OPTICAL ZOOM CAMERA COMBINATIONS THAT ARE UNABLE TO OPERATE IN 8" DIAMETER PIPE WILL BE DEEMED UNACCEPTABLE.**

The transporter, when used with the pan & tilt camera, shall fit into a 7" diameter circular

area with the camera in the home position to optimize clearance in an 8" diameter relined pipe.  
ALL TRANSPORTER / PAN & TILT COMBINATIONS THAT ARE UNABLE TO OPERATE IN 8" RELINED PIPE SHALL BE DEEMED UNACCEPTABLE.

The combined length of the transporter / pan & tilt camera assembly shall not exceed 29 ¼" with the camera in the home position.

This will allow the inspection and traversal of 8" diameter pipe with off sets or meandering conditions and facilitate entry into short inverts.

CAMERA / TRANSPORTER ASSEMBLIES EXCEEDING 29 ¼" IN LENGTH WILL BE DEEMED UNACCEPTABLE.

### **Tires**

The Transporter shall include (6) wheels, available in various sizes, designed to maximize traction in each pipe size.

The (2) smaller diameter wheels, designed to help negotiate offsets in Larger pipe configurations, shall remain affixed to the middle axle, regardless of pipe size to be inspected.

The transporter shall be capable of inspecting pipes up to 60" diameter with the addition of larger diameter wheels.

**\*\*SEE COMPONENT LIST FOR EXACT CONFIGURATION OF WHEELS\*\***

TRANSPORTERS DRIVEN BY BELTS WILL NOT BE ACCEPTABLE.

TRANSPORTERS WITH EXTERNAL DRIVE TRAIN COMPONENTS WILL BE UNACCEPTABLE.

**1 10" - 15" RUBBER TIRE KIT**

**1 10" - 15" SPACER KIT FOR SPR/PR, v2**

**1 18"+ PNEUMATIC TIRE KIT**

**1 ELECTRIC CAMERA LIFT**

An electronic, remote controlled, infinitely variable camera lift shall be provided to prevent the need for an operator to enter the manhole to position and/or reposition the camera height.

Shall be constructed of stainless steel and aluminum and designed for use in 10" - 36" diameter pipe.

Shall be able to provide a "center of pipe" view.

Shall be operated with the remote camera carrier controller.

The transporter, when used with the pan and tilt optical zoom II camera, shall have the following variable camera heights:

Small wheel configurations (10"-15"): variable from 3.9" in the collapsed position to 11.77" in the extended position

Large wheel configurations (18"-36"): variable from 7.16" in the collapsed position to 15.02" in the extended position

The height shall be adjusted from the collapsed position to the extended position with the remote camera carrier controller.



The time required to accomplish the full height position in either small or large configurations shall not exceed 5 seconds.

Shall include an automatic drop-down feature when powered OFF" to ensure safety.

Shall be compatible with CUES Pipe Ranger and Steerable Pipe Ranger transporters.

Shall be compatible with CUES OZ pan and tilt optical zoom, OZII pan and tilt optical zoom, and Night Owl pan and rotate cameras.

Shall be compatible with CUES multi-conductor or single-conductor 2000 Pipe Ranger transporters.

Shall include an extended y-eliminator cable and all necessary mounting hardware.

Shall include an automatic latching hook with steel wire cable for easy transporter retrieval.

Shall be manufactured with o-rings and oil seals that are designed to prevent water intrusion.

The maximum lift weight: 16lbs.

Overall weight: 10lbs.

## **1 12" - 15" PNEUMATIC TIRE KIT**

### **1 CAMERA ASY, REARVIEW**

The rear-view camera shall be designed to facilitate the internal inspection of pipelines to avoid obstacles and potential tip-over when retrieving a steerable transporter or driving in reverse. The camera shall be designed to operate in conjunction with the customer's existing Pipe Ranger wheeled transporter, mechanical or no lift, and mainline inspection camera and shall consist of the following (minimum):

#### **Camera**

Shall be manufactured with solid state circuitry to withstand shocks and vibrations.

Shall include fixed focus, fixed iris, and auto speed shutter.

Shall include a light head containing a minimum of 12 light emitting diodes equaling 78 foot candella.

Shall be a color camera.

Must illuminate up to 30" pipe.

#### **Electrical Specifications & Camera Requirements**

##### **Image Sensor**

CCD, solid state 1/4" diagonal with DSP.

Pixels, 512 H x 492 V.

Total pixels, 251,904

##### **Minimum Illumination**

2 Lux.

##### **Resolution**

380 Lines TV Horizontal.

##### **System Standard**

NTSC, Color

##### **Video Output**

1 V, S/N 46dB or greater

##### **Lens**

2.8mm, F/2.2

##### **Field of View**

98 degrees diagonal, 79 degrees (H) wide, 59 degrees (V) high

##### **Electronic Shutter**

1/60 s to 1/96,000 s

White Balance

Auto track

Light Power

120VDC, 160mA., 1.92W Supplied from the internal power supply

Input Camera Voltage

30VDC to 75VDC, 3W

Working Pressure

50 PSI (minimum)

Operating Temperature

0 degrees to 45 degrees C

Camera Lightring

The camera shall include a built-in lightring containing 12 solid state light emitting diodes (LEDs).

Lightring

Shall be sealed to prevent water entry.

Shall include variable light intensity to allow for a clear picture in the pipeline.

The LEDs shall be recessed and o-ring sealed to prevent damage from obstacles in the pipe.

Systems with exposed bulbs subject to breakage will not be acceptable.

The total light output of the 12 LEDs shall equal 78 foot candella.

Shall include a unique over-voltage protection circuit to prevent burnout of the LEDs.

LEDs shall be individually serviceable and replaceable at the service facility.

LEDs that cannot be replaced individually and / or lighthoods that have to be completely replaced for servicing shall be deemed unacceptable.

Camera Protective Housing

The camera electronics shall be housed in a sealed, damage resistant, rugged enclosure capable of being easily attached or removed in the field.

## **1 COMBINATION VIDEO TRANSMISSION/TOW CABLE, KEVLAR FIBER ARMORED, - MULTI-CONDUCTOR**

A combined video and towing cable shall be furnished in a continuous length of 1000 feet (minimum) and shall consist of the following (minimum):

Cable

The cable shall consist of a coaxial core wrapped with a braided wire shield ground return.

An additional braided wire shield shall encircle both the coax and ground return and shall act as a Faraday shield.

**CABLES WITH ONLY A SINGLE BRAIDED WIRE SHIELD ACTING AS A GROUND RETURN SHALL BE DEEMED UNACCEPTABLE.**

A total of 10 separately insulated and color-coded 18/20 gage standard copper conductors shall be bundled and twisted in groups of 3 with one conductor remaining single.

To prevent cable breakage when placed under load, all wire bundles, wires, and the coax shall twist in a serpentine pattern for the entire length of the cable so that all wires, including the coax, are the same total lengths.

**CABLES THAT HAVE A CENTER'COAX, MAKING IT THE SHORTEST AND THEREFORE THE MOST EASILY BROKEN CONDUCTOR, SHALL BE DEEMED UNACCEPTABLE.**

The cable diameter shall be no greater than .450 inches and shall be able to withstand external pressures of up to 400 psi.

The cable weight shall not exceed 110 lbs. per 1000 feet.

#### Cable Jacket

The exterior of the cable shall consist of a minimum 1/16" thick abrasion resistant high-density nylon composite outer jacket embedded with Kevlar fibers to provide the cable with the required towing tensile strength.

Shall provide a lower coefficient of friction to reduce drag and therefore increase its resistance to wear.

#### Cable Connection

The end of the multi-conductor cable shall be equipped with a waterproof scotchcast and/or waterproof metal splice chamber to allow for the direct wiring of the female connectors.

An adjustable strain relief shall be provided to transfer the cable towing strength from the cable to the camera skids or transporter.

The termination shall consist of the necessary connectors and dummy plugs.

### **1 TV CABLE REEL ASSEMBLY**

A TV cable reel assembly will be supplied with a minimum storage capacity for 1000' of 1/2" or 5/8" maximum diameter video transmission cable. The reel shall be chain driven and properly reinforced to withstand 200% of the maximum motor torque to insure trouble-free operation. The reel shall be powered by a variable speed electric motor and driven through a multi-gear ratio transmission. The transmission will have multiple speeds to limit the motor load during varying towing conditions. The reel shall be equipped with an automatic level wind assembly to evenly pay out or rewind the cable to prevent pile-ups, entanglements and burying. The reel shall be built into a rugged frame designed for fixed mounting into a unit. The TV reel shall include a stainless steel drip pan that is removable for complete cleaning. The stainless steel drip pan shall be removed by unpinning it, then sliding it out from below the reel towards the rear of the truck. The reel shall have a black thermoplastic powder coated frame that provides excellent corrosion and UV protection and is resistant to chemical such as acids and alkalis. The reel drum and level wind shall be open to view to allow for inspection during operation. TV REEL SYSTEMS THAT ARE NOT CONTROLLED REMOTELY OR DO NOT HAVE A MULTI RATIO TRANSMISSION WILL NOT BE ACCEPTABLE.

#### TV CABLE REEL SLIP RING ASSEMBLY

The reel shall be equipped with a continuous contact rotary slip ring assembly. The assembly will be equipped with a minimum of twelve (12) slip rings to conduct the necessary current and signals through the reel. SLIP RING ASSEMBLIES WITH LESS THAN TWELVE (12) RINGS WILL NOT BE ACCEPTABLE. The slip ring assembly shall be fully enclosed in a dust and weatherproof high strength aluminum housing. Systems equipped with the high maintenance copper slip ring assemblies shall not be considered acceptable. Mercury Slip Rings shall not be considered acceptable.

#### CABLE FOOTAGE METER, LOCAL/REMOTE ELECTRONIC READOUT

The unit shall be equipped with a distance counting meter designed to accurately measure cable travel in feet and tenths of feet. The metering head shall be constructed of machined cast aluminum parts and shall include the necessary sheaves, wheels and guides. The counter shall be equipped with a meter for use at the rear of the unit and an electronic counter, which is connected to the Data Display System at the operators station.

#### TV CABLE REEL CONTROL REMOTE AND LOCAL

A gearshift selector and linkage shall be provided at the control console to operate the reel mounted transmission. The combination of the reel motor controller and transmission gearshift selector will maximize the efficiency of the television inspection operation and minimize the load on the reel and motor. A speed controller, gearshift selector and on/off switch shall be provided at the reel for local control during set up.

## **1 AUTOMATIC PAYOUT SYSTEM FOR REEL - INSTALLED**

### **1 19" (MINIMUM) FLATSCREEN COLOR INDUSTRIAL TV MONITOR NTSC / PAL COLOR STANDARDS**

Shall be a high quality, ultra-thin, industrial grade color unit.

Shall be a desk-mounted computer display in the Viewing Room of the vehicle.

Shall be compatible with both NTSC and PAL signals; shall include an auto-detect function that has the ability to identify the signal that's being input and automatically switch from NTSC or PAL.

Shall have the ability to automatically monitor / adjust the video input and optimize the display settings without manual adjustments.

Shall include an On-screen Menu for adjusting monitor parameters. The menu shall include a user-friendly graphical interface to guide users through the customization of features and Individual preferences.

Shall operate from 120V AC or 230V AC power sources.

Shall be black in color with a metallic finish.

### **1 PCU ASSEMBLY**

A fully integrated camera, lighting, and crawler control system, built into rack-mounted chassis for installation in a built in control console consisting of a Power Control Unit (PCU) and a Camera Control Unit (CCU) not occupying more than 8-3/4" vertical rack height, shall be provided.

The Power Control Unit (PCU) portion of the Control Center must be capable of operating a mini camera, pan & tilt camera, pan & tilt zoom camera used with skids or a steerable tractor without the use of external adapter modules.

The PCU shall provide all the necessary power to operate and monitor the television inspection system. The faceplate shall be heavy gauge aluminum finished with an industrial grade finish. The PCU shall operate from a 110VAC or 220VAC 50Hz. or 60 Hz. power source. All circuits shall be of solid state design. Circuits shall be isolated to provide operator protection from electrical shock hazards.

The PCU shall contain a solid state light head power source, a left transporter motor power source, a right transporter motor power source, and a camera power source. All four power sources will include electronic over current protection to protect connected equipment from excess current. The PCU circuit protection will prevent damage to the PCU in the event of a cable short and shall recover immediately without operator action after the short condition is removed. All four power supplies shall be voltage controlled and current limit controlled by the CCU without operator action.

### **1 CCU ASSEMBLY**

The CCU shall connect to and control all functions of the PCU, the camera, and the transporter. The CCU faceplate shall be heavy gauge aluminum finished with an industrial grade finish. External connections shall include two buffered external video monitor outputs, two USB ports,

audio and video VCR/DVD input/output plugs. The CCU will also include hardware and software to display video, system configuration and diagnostic conditions with a built-in alpha/numerical video character generator. The character generator shall generate footage count, defect Information, and/or free-form comments, for display on a video monitor and video recording device.

The CCU software shall be field upgradable with a USB thumb drive. The CCU shall also be capable of full external control by Asset Inspection/Decision Support software. The CCU Software will include cable diagnostics which can determine an open or short in the mainline cable. It will also allow monitoring of the voltage and current on all four power supplies and testing the handheld controller.

A standard (IBM) "QWERTY" keyboard shall be provided for generating defect and commentary entry. The format and position of the on-screen data shall be adjustable, within the video display, to fit pipe conditions or operator requirements. An inspection report can be saved and exported In an ASCII file format. The data generator shall have the capability send an inspection report copy containing contract data, footage and defects to a USB thumb drive. The inspection report shall include the following minimum information: date of inspection; pipe size, material, total Length; upstream access location; downstream access location; direction of inspection (N-S-E-W and upstream/downstream); name of line; lateral location and footage; observations and comments (6 lines) , 55 preprogrammed defect codes and 70 user definable.

#### **1 PORTABLE CONTROLLER**

A hand held portable controller for a pan & tilt type camera, steerable transporter and reel will be provided. The controller will be capable of wireless operation, and include a weatherproof 24 key membrane panel with indicator lights. Joystick controls will be provided for camera pan and tilt operation and transporter forward, reverse and steerable functions. Camera controls will include focus and iris override, zoom, lights and light intensity, pan and tilt homing, one button auto focus, and diagnostics. Transporter controls will include cruise control and camera lift operation. Reel controls will include retrieve and release mode, and speed [Not applicable on Dolly applications]. The controller shall be fabricated of a high impact plastic material, and housed in a neoprene boot for protection. A holster shall be provided for storing the remote at the control unit.

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#### **1 8.7" MINI KEYBOARD**

#### **1 TV MAINTENANCE TOOL KIT**

#### **1 TRAINING, ON-SITE (THREE DAYS)**

The supplier shall fully instruct and test buyers in the operation of the equipment furnished after

delivery. The instruction period shall be of sufficient duration (number of days shown on the component list) to fully familiarize the buyers operating personnel. The instruction and testing shall be conducted by the supplier's field service technician and shall include component familiarization, theory of operation, equipment operation, field procedures, techniques of use, troubleshooting, maintenance recording and logging of sewer conditions and safety procedures. Training provided by sales or office personnel will not be acceptable.