

## 7.4 Technology Safety Data Sheet

<b>Technology Safety Data Sheet</b> <b>CD 42 TRACKING AND LOCATING TECHNOLOGY</b> <b>(OENHP #: 2001-06, Version A)</b>
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Section 1: Technology Identity		
Technology Name(s):	Emergency Contact:	
CD 42 Tracking and Locating Technology	Mr. Eric Farque	
Manufacturer's Name and Address:	Information Contact:	
CDI 524 South Main Street Broken Arrow, Oklahoma 74012 (800) 580-4234 USA & Canada Toll free (918) 258-6068 Worldwide (918) 251-9851 FAX	Mr. Eric Farque	
Date Prepared:	TSDS Version Number:	Prepared By:
July 2001	2001-06 Version A	Operating Engineers National Hazmat Program 1293 Airport Road, Beaver, WV 25813 Phone: (304) 253-8674 Fax: (304) 253-1384

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**Section 2: Technology Description**

The CD42 System consists of three system components and a delivery device. The CD42 System components include a CD42-Tx transmitter (encased in a site-specific device), a CD42-R Receiver and a CD42-GP Antenna. System components are shown in Section 3.

The CD42-Tx is a battery operated 22-Hertz (Hz) electromagnetic transmitter. When encased in the device shown, the CD42-Tx weighs approximately 5-7 pounds (lbs.). Although the CD42-Tx generally uses product flow to move through a pipeline, it will require a delivery device for field application at a DOE facility. Two delivery devices are highlighted in this TSDS, an electrically powered pipeline snake and a high-pressure water jet.

The CD42-R is a battery operated receiver/microprocessor unit, which displays the transmitted pulses and allows the operator to track and locate the transmitter. The receiver has a handle on either side of the graphic screen and a shoulder/neck strap for placement on the operator. The receiver weighs approximately 7-10 lbs. The CD42-GP is an encased nylon antenna that weighs approximately 10 lbs. and is approximately 2.5 ft. long. The antenna also has a shoulder/neck strap for placement on the operator.

The delivery devices identified transport the CD42-Tx transmitter. The metal pipeline snake is housed in a motor-driven rotating cage, which assists the operator in feeding the snake and attached transmitter into the pipeline. Electricity is provided to the motor by connection to a fixed facility electrical system or a small mobile generator. The

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**Section 3: Technology Pictures**

**D42 System Components**



Figure 3-1: CD42-Tx Transmitter



Figure 3-2: CD42-R Receiver



Figure 3-3: CD-GP Antenna

**CD42 System Used with Delivery Devices**



Figure 3-4: CD42 System and snake



Figure 3-5: CD42 System and water jet

**Tracking and Locating the CD42 – Tx transmitter**



Figure 3-6: Identifying general CD42-Tx location



Figure 3-7: Identifying exact CD42-Tx location

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**Section 4: Safety Hazards**

Hazard Category:  
4 – Could result in death or permanent total disability  
3 – Could result in permanent partial disability or injuries or occupational illness that may result in hospitalization of at least three persons  
2 – Could result in injury or occupational illness resulting in one or more lost work days  
1 – Could result in injury or illness not resulting in a lost work day

A. Buried Utilities, Drums, and Tanks	Hazard Rating: N/A
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Not associated with the CD42 System or individual delivery devices.

B. Chemical (Reactive, Corrosive, Pyrophoric, etc)	Hazard Rating: N/A
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Not associated with the CD42 System or individual delivery devices.

C. Confined Space	Hazard Rating: N/A
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Confined spaces are not part of the CD42 System or delivery device design.

D. Electrical	Hazard Rating: 2
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- Follow manufacturer or site-specific lockout/tagout procedures when performing maintenance work on either delivery device.
- Provide ground-fault circuit protection between delivery device (snake) and power source.

E. Explosives	Hazard Rating: N/A
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Not associated with the CD42 System or individual delivery devices.

F. Fire Protection	Hazard Rating: 2
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- Flammable vapors and heat may be generated by fuel-powered equipment on or used with the delivery device. Use this type of equipment in a well-ventilated area and isolate it from other ignition sources and combustible materials.
- Electrical fires may result from AC current and electronic equipment on or used with the delivery devices.
- Flammable vapors and static electricity may be created when refilling fuel-powered equipment. Properly rated fuel storage/transfer cans should be used and bonded to equipment during filling.

G. Gas Cylinders	Hazard Rating: N/A
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Not associated with the CD42 System or individual delivery devices.

H. Ladders/Platforms	Hazard Rating: N/A
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Not associated with the CD42 System or individual delivery devices.

I. Lockout/Tagout	Hazard Rating: 1
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Lockout/tagout procedures are not required for the CD42 System. However, both delivery devices have electrical and mechanical components. Equipment- specific procedures should be developed and implemented, using manufacturer guidance, for maintenance procedures on the snake and water jet.

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J. Mechanical Hazards	Hazard Rating: 3
Pinch points and entanglement hazards are associated with both the snake and water jet while feeding and retrieving the CD42-Tx into/from the pipe.	
K. Moving Vehicles	Hazard Rating: N/A
A forklift and/or vehicle are needed to move and position the delivery devices in a work area. Qualified individuals who are trained and licensed/certified must operate the forklift and vehicle. Standard operating practices should be developed in accordance with the appropriate OSHA and DOT requirements.	
L. Overhead Hazards	Hazard Rating: 2
The CD42-Tx may be placed in an overhead pipe. In this case, the delivery line (snake or hose) must be pushed into and pulled from a pipe overhead, and the CD42-GP must be held overhead while locating the CD42-Tx. Place delivery device on elevated platform to eliminate overhead push/pull. Provide a telescoping extension for the antenna so that operator can position it overhead and hold the extension at waist height.	
M. Pressure Hazards	Hazard Rating: 4
<ul style="list-style-type: none"> <li>• The water jet is rated for 2500psi of water pressure. Hose and hose connections should be inspected prior to use.</li> <li>• Operator should place CD42-Tx and the first foot of hose in the pipe before fully pressurizing the hose. The CD42-Tx could become a projectile if the hose connection is not secure.</li> <li>• Hose and CD42-Tx should be connected anytime water jet is fully pressurized. The pressurized stream of water could cause severing injury if directed at an individual.</li> </ul>	
N. Slips/Trips/Falls	Hazard Rating: 2
<ul style="list-style-type: none"> <li>• Walking the length of the pipe, over variable terrain, to locate the CD42-Tx and pipe blockage may expose the operator to tripping and falling hazards. The operator generally focuses attention on the graphic screen of the receiver, rather than terrain, while locating a pipe blockage.</li> <li>• Extension cords and hoses are connected to both delivery devices, creating tripping hazards for the operator. Cords should be identified and protected.</li> <li>• The water jet water tank may be discharged in work area, creating slippery conditions. A drainage or alternative collection system should be provided.</li> </ul>	
O. Suspended Loads	Hazard Rating: N/A
Not associated with the CD42 System or individual delivery devices	
P. Trenching/Excavation	Hazard Rating: N/A
Not associated with the CD42 System or individual delivery devices	

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**Section 5: Health Hazards**

A. Inhalation	Hazard Rating: 2
<ul style="list-style-type: none"> <li>• CD42-Tx and the delivery line (snake or hose) may become contaminated in the pipeline. Decontamination during retrieval is necessary.</li> <li>• Surface and air sampling may be warranted depending on the contaminants present in the pipeline.</li> <li>• Both the generator (snake) and water jet motor will produce combustion products, like carbon monoxide. Position the equipment in ventilated areas. Air monitoring may be warranted if equipment is used in a confined area.</li> <li>• Refueling the generator (for the snake) and water jet motor may produce gasoline vapors (which can include benzene). Refuel the equipment in ventilated areas. Air monitoring may be warranted if equipment is used in a confined space.</li> </ul>	
B. Skin Absorption	Hazard Rating: 3
<ul style="list-style-type: none"> <li>• CD42-Tx and the delivery line (snake or hose) may become contaminated in the pipeline. Decontamination during retrieval is necessary.</li> <li>• Surface and air sampling may be warranted depending on the contaminants present in the pipeline.</li> <li>• Refueling the generator (snake) and water jet motor may result in contact with gasoline. Use impermeable work gloves to transfer fuel.</li> </ul>	
C. Noise	Hazard Rating: 2
<ul style="list-style-type: none"> <li>• The CD42 System does not produce sound levels that exceed the OSHA action level or ACGIH TLV.</li> <li>• Both the individual delivery devices create noise or have a noise source associated with their operation. Noise levels do not exceed the OSHA action level or ACGIH TLV in the operator's work area during CD42-Tx entry, location and retrieval. But noise levels adjacent to the noise sources are at or exceed both limits. Workers should stay clear of the noise sources during operation. Workers should wear hearing protection while conducting maintenance tasks requiring operation of the noise sources.</li> </ul>	
D. Heat Stress/Cold Stress	Hazard Rating: 1
<ul style="list-style-type: none"> <li>• The CD42 System and individual delivery devices do not produce heat.</li> <li>• The CD42 System and individual delivery device may require the worker to conduct moderate to heavy work for short periods, which may increase the risk of thermal stress in hot environments.</li> </ul>	

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E. Ergonomics	Hazard Rating: 3
<ul style="list-style-type: none"> <li>• Manually transporting, or positioning the individual components of the delivery devices (generator, snake and water jet trailer) may create bending and lifting hazards. Transport and position all components using a forklift or vehicle as close to the work area as possible. Empty the water tank before moving the water jet. Several (2-3) individuals should lift and position any of the components.</li> <li>• Cramping, pain and strain may be created by holding the CD42-GP antenna or CD42-R receiver in a static position for an extended period of time. Use shoulder strap to distribute weight across body and hand to hold antenna in position.</li> <li>• Pulling slack, pushing the delivery line and retrieving the delivery line may create bending, lifting and twisting hazards. Investigate alternative delivery devices that provide a mechanical advantage during both the pushing and pulling cycles.</li> </ul>	
F. Ionizing Radiation	Hazard Rating: 3
<ul style="list-style-type: none"> <li>• Ionizing Radiation is not associated with the CD42 System or either delivery device.</li> <li>• CD42-Tx and the delivery line (snake or hose) may become contaminated by the contents of the pipeline. Decontamination during retrieval is necessary.</li> <li>• Exposure to direct radiation fields may occur, depending on the radiation level of the contents within the pipe and the radiation shielding characteristics of the pipe</li> </ul>	
G. Non-ionizing Radiation	Hazard Rating: 1
<p>CD42-Tx emits extremely low frequency (22 Hz) electromagnetic radiation, which is equivalent or less in intensity than other electronic equipment used by the operation. The transmitter is maintained at a variable distance from the operator</p>	
H. Biological Hazards	Hazard Rating: N/A
<p>Not associated with the CD42 System or individual delivery devices.</p>	
I. Other	Hazard Rating: N/A
<p>None noted</p>	
<p><b>Section 6: Phase Analysis</b></p>	
<p>A. Construction/Start-up</p>	
<ul style="list-style-type: none"> <li>• Manually transporting and positioning the snake, generator and water jet may expose operator to ergonomic risk factors like awkward body position (bending, twisting) and lifting excessive loads ultimately resulting in muscular/back injury.</li> <li>• Electrical cords and water-hoses used to power and supply the delivery devices create tripping hazards.</li> <li>• This phase involves minimal potential exposure to radioactive materials or direct radiation fields unless performed in a Radiation or High Radiation Area, a Contamination or High Contamination Area, or an Airborne Radioactivity Area.</li> </ul>	

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**B. Operation**

- Pulling, pushing and retrieving delivery line from the pipe may expose operator to ergonomic risk factors like awkward body positions (bending, twisting) and applying force ultimately resulting in muscular/back injury. These activities also expose the operator to pinch points and entanglement resulting in hand, arm and upper-body injury.
- Holding the CD42-GP and CD42-R in a static position while locating CD42-Tx may result in upper body cramping, pain or muscular strain.
- Discharging water from water jet tank may create slick surfaces, resulting in slips/trips/falls.
- Focused attention on CD42-R may expose operator to rough terrain, or walking obstructions resulting in slips/trips/falls.
- Operation of oil/gasoline motors may result in exposure to combustion products and flammable vapors if the work area is not well ventilated.
- Individuals standing adjacent or around motors or generators may be exposed to noise levels at or exceeding the ACGIH TLV unless proper hearing protection is worn.
- Deliver lines may become contaminated during delivery and must be decontaminated during retrieval of CD42-Tx.
- If operated within a Radiation or High Radiation Area, the operator may be exposed to direct radiation fields.
- Once opened, the operator may be exposed to pipeline contents. Operator may be exposed to direct radiation fields, and/or radioactive and toxic contaminants.

**C. Maintenance (Emergency and Routine)**

- Maintenance on oil/gasoline motors or high-pressure water lines may expose employees to electrical shock or high-pressure injection unless these are properly disconnected, de-energized and locked/tagged.
- If maintenance is conducted within a Radiation or High Radiation Area, the worker may be exposed to direct radiation fields.
- Maintenance on contaminated equipment will result in operator exposure to radioactive and toxic materials. Delivery lines and the CD42-Tx transmitter may become contaminated during operation, ensure decontamination is effective during retrieval.

**D. Shutdown (Emergency and Routine)**

Risk of radiation contamination is particularly increased during shutdown to retrieve a transmitter stuck in the line. High pressure hazards are also of increased concern during shutdown.



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E. Decontamination/Decommissioning

- Ergonomic and physical hazards are similar to Construction/Start-up.
- Transmitter and delivery lines may become contaminated during operation, ensure decontamination is effective before decommissioning.
- Decontamination may consist of a wipe down and/or soaking. Depending on the level of contamination, the decontamination may take place within a ventilated area, a glovebox, a tent, or other protected area.

**Section 7: Worker Protection Measures**

A. Exposure Monitoring

- Personal and area air monitoring is warranted if suspected/known vapor, gas, liquid and solid contamination exists. Air monitoring is particularly critical when the area is contaminated with radioactive materials or highly toxic agents.
- Workers in an Airborne Radioactivity Area, especially those workers required to wear respiratory protection, may be monitored for intake of the airborne radioactivity. Air monitoring may be performed in the general area or in the breathing zone of the worker.
- DOE generally requires that workers in radiation areas wear radiation dosimeters. For work in Radiation, High Radiation, and Very High Radiation Areas, a self-reading dosimeter will likely also be prescribed.
- DOE generally requires that workers and equipment inside Contamination and High Contamination Areas be frisked with radioactivity detectors at the Radiological Buffer Area when leaving the contamination areas. This frisking may be a self-performed survey of one's own body surfaces, or a trained Radiological Control Technician may perform this survey.

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**B. Worker Training**

- The following subjects should be covered in a training program for workers:
- Proper set-up, use and maintenance of the CD42 System, based on manufacturer's users manual.
- Proper set-up, use and maintenance of the delivery device and power supply, based on the Manufacturer's user manual.
- Ergonomic hazards awareness and proper lifting techniques, including appropriate site/equipment specific requirements (i.e., those identified in this TSDS).
- Site-specific and equipment-specific lockout/tagout procedures based on manufacturer's users manual.
- Site-specific and equipment-specific decontamination procedures to remove radiological and chemical contamination from the tether line while retrieving the CD42-Tx transmitter.
- Site-specific and equipment-specific emergency response plan.
- Other safety and health training that may be required by OSHA or may be useful:
  - HAZWOPER
  - Hazard Communication
  - Personal Protective Equipment (use, inspection, storage, maintenance)
  - Electrical Safety
  - Lockout/Tagout
  - Thermal Stress Prevention (Hot or Cold Stress signs/symptoms/prevention)
  - Forklift Operation/Safety
  - Fire Prevention/Protection
- DOE requires varying levels of radiological training prior to working in radiological areas depending on the area entered, radiation and contamination levels present, and the type of work to be performed. Training requirements are specified in the Radiological Control Standard, and include: Orientation Training, General Employee Radiological Training (GERT), Radiological Worker I Training (RWI), and Radiological Worker II Training (RWII).

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**C. Medical Surveillance**

- A qualified physician should determine site-specific medical surveillance requirements based on the hazards identified in this TSDS. Surveillance may include a physical examination with emphasis on a worker's general health; history of exposure to ergonomic risk factors, noise and temperature extremes; and current conditions related to each. Additional examinations may be required by applicable OSHA standards, depending on the site contaminants.
- If workers will be exposed to noise levels exceeding the OSHA action level (85 dBA), then they must be enrolled in a Hearing Conservation program and receive annual audiograms.
- Workers entering contamination or airborne radioactivity areas may be required to participate in a bioassay, monitoring program. Depending on the type of radioactivity deposited internally, whole-body counting (or organ-specific counting) could also be required. This is a non-invasive procedure that quantifies low-levels of internally deposited radionuclides by externally scanning the body (or portion of the body).

**D. Engineering Controls**

- Alternative delivery devices that will transport the CD42-Tx without a physical connection will lower operator exposure.
- Modifying the CD42 System software/audible component to reduce the demand for the operator's attention to the graphic screen will reduce the risks of tripping and falling.
- The use of padded shoulder straps to distribute weight of receiver and antenna across the body will reduce stress on the worker.

**E. Administrative Controls**

Monitoring work/rest schedules during summer months can prevent heat stress illnesses.

**F. Personal Protective Equipment**

Gloves should be worn, at a minimum, but full anti-C protective clothing and respirators may be required because of radiation exposure. The required PPE will be determined at the site of use. See Section 9 for more details.

**Section 8: Emergency Preparedness**

Emergency response procedures should identify how the hazards noted in this TSDS (particularly physical injury, fire or explosion, and gasoline exposure or spills) will be addressed by workers in the work area. It is recommended that one worker per operation shift be trained to provide first aid and CPR. Each worker should be trained and understand how to respond to each emergency scenario (injury, fire, spill). Training should include site roles, on/off-site response resources and telephone numbers. If the work area is contaminated (suspected or known), then appropriate actions must be taken to protect employees under routine and emergency conditions.

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**Section 9: Comments, Lessons Learned, and Special Considerations**

The CD42 System has very few inherent health and safety hazards. The health and safety hazards identified were generally noted for one of the two delivery devices (electric snake, water jet) identified. Alternative delivery devices should be carefully evaluated before use. Key considerations should be ease of use, level and range of hazards associated with operation, and need for decontamination (if tether line is used). Suspected or known work area contaminants will also affect the health and safety of workers. The work area contamination and pipeline contents should be characterized before any work begins.

DOE regulations for occupational radiological protection require written authorizations to control access to and work in radiological areas. If the demonstrated technology is used at a DOE facility on pipes that contain radioactive material, such authorization will need to be implemented. The Radiological Work Permit (RWP) is the administrative mechanism used to establish radiological controls for intended work activities. The RWP, typically prepared by or with the site Radiological Control Organization, would include the following information:

- Description of work
- Work area radiological conditions
- Dosimetry requirements
- Pre-job briefing requirements, if applicable
- Training requirements for entry
- Protective clothing and respiratory protection requirements
- Radiological control coverage requirements and stay time controls, as appropriate
- Limiting radiological conditions that may void the RWP
- Special dose or contamination reduction considerations
- Special personnel frisking considerations
- Technical work document number, as applicable
- Unique identifying number
- Date of issue and expiration
- Authorizing signatures