

CCP-CM-012

Revision 0

CCP

Remote-Handled Transuranic Waste Dose Rate Measurement Instrument (DRMI1)

(Equipment #RH-DTC-RHAT-01)

Equipment Description

EFFECTIVE DATE: 05/14/2007

Mark Percy

PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	05/14/2007	Initial issue.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
CCP	Central Characterization Project
CFR	Code of Federal Regulations
DOE	Department of Energy
DRMI	Dose Rate Measurement Instrument
DTC	Dose-to-Curie
EPA	Environmental Protection Agency
k/g	kilogram
LCD	Liquid Crystal Display
LWA	Land Withdrawal Act
mrem/hr	millirem per hour
mR/hr	milliRoentgen per hour
M&TE	Measuring and Test Equipment
NFPA	National Fire Protection Association
PPE	Personal Protection Equipment
ppm	parts per million
RH	Remote Handled
R/h	Roentgen per hour
RTR	Real Time Radiography
STD	Standard
TRU	Transuranic
WIPP	Waste Isolation Pilot Plant
WIPP WAC	Waste Isolation Pilot Plant Waste Acceptance Criteria

SUMMARY

The Remote-Handled (RH) Transuranic (TRU) Waste Dose Rate Measurement Instrument (DRMI) System (Equipment No. RH-DTC-RHAT-01) is used to obtain the gamma dose reading of RH TRU waste. The DRMI is a group of components and not a facility structure. An ion chamber is used for determining the gamma dose rate. The DRMI is a passive system for measuring radiological dose rates that does not generate radiation.

This Equipment Description (ED) is not an authorization basis document. It is a piece of Central Characterization Projects (CCP's) Configuration Management program and is intended to be used as technical information for the Host site's use when incorporating CCP's equipment into their safety basis. This ED is a central coordinating link among the engineering design documents, the facility authorization basis, and implementing procedures. This ED does not originate requirements or basis information, but rather collects that information into a convenient usable form. The ED consolidates information about the RH TRU waste DRMI system into one document.

1.0 SYSTEM DESCRIPTION

The DRMI concept is based on the Dose-to-Curie (DTC) estimation method described in Attachment B, DTC Survey Procedure for RH TRU Waste of DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan (WCPIP)* (Ref. 2).

The technical basis for application of the DTC conversion methodology is specified in waste stream-specific Radiological Characterization Reports. A Radiological Characterization Report describes the modeling methodology and quantifies the DTC scaling factors and measurement uncertainty applicable for a given waste stream. Waste stream-specific Radiological Characterization Reports are not referenced in this Equipment Description.

The WCPIP describes a general method and provides requirements for estimating TRU and other significant radionuclides in RH TRU waste (Ref. 2). The method is referred to as the DTC method. The DTC method involves measuring the gamma dose rate at a fixed distance from the exterior of the waste container and using the results from the analysis to estimate the activity levels (i.e., curie content) of the desired isotopes. This process applies to TRU RH waste placed in a 30- or 55-gallon container having an exterior gamma dose rate proportional to the distribution of key radioisotopes within the container. The population of RH waste containers to be measured may consist of 30 and 55-gallon drums. The DTC measurements are performed using a gamma radiation detecting ionization chamber. Only personnel trained and qualified in accordance with the Central Characterization Project (*CCP Training and Qualification Plan* (CCP-QP-002) operate equipment (Ref. 4). Dose rate in this document refers to the exposure rate due to gamma radiation. No contribution from neutron or beta radiation is included.

1.1 Transuranic Drums Waste Process Flow

The following is a typical flow process. Actual system operations and application are performed in accordance with CCP approved procedures. The DRMI system measuring capacity is one drum per cycle. A Host Site forklift or crane device may be used to remotely position the drum on the drum turntable. The waste movement devices may vary from site to site and are described in this document.

1.1.1 Dose Rate Measuring

The execution of dose rate measurement of containers is through performance of routine startup, normal operations, and shutdown of the dose measurement instrumentation.

- Shift Startup:
 - Operators ensure all prerequisites have been met by procedure
 - Operator turns on the drum turntable and verifies operation
 - Operator turns off the drum turntable
 - Operator verifies that the calibration of the scale is current
 - Verify scale is operating
 - Place check weight on scale
 - Verify scale is reading within 2 percent of the check weight
- Ion Chamber Daily Source Check of the instrument:
 - Ion Chamber Daily Source Check is performed at least once per day prior to the first dose rate measurement of the shift, or when switching to a probe that has not been source checked on the same shift.
 - Ion Chamber Daily Source Checks may be performed simultaneously or before shift startup.
 - Two Ion Chamber Probes are available for use with the RO-7.
 - RO-7LD – range 1,999 milliRoentgen per hour (mR/hr) at full scale with resolution of 1 mR/hr
 - RO-7BM – range 199,900 mrem/hr at full scale with resolution of 100 mR/hr
 - RO-7BH – range 19.99 kR/hr @ full scale w/resolution of 10R/h

The appropriate probe must be connected to the RO-7 instrument prior to any source checks, background measurements, or container measurements. Drum dose rate measurements may necessitate using a lower range probe for background

measurements. Background measurements taken with a lower range probe may be used for any drum dose rate measurements taken with a higher range probe.

The RO-7 probes are positionally sensitive. The probes must be oriented in the same geometry in relation to the measured container each time. This orientation must be consistent with the calibration geometry. The instrument detector must be 1 meter from the container. A jig that positions the instrument with relation to the container is used to ensure reproducible results. The calibration on the Ion Chamber instrument and probe must be current, and recorded. The RO-7 display indications coincide with the probe connected and must be verified. A verification of the battery check is performed. Adjustment of the instrument zero reading, if necessary, must be performed in a low-radiation area away from where the container dose measurements are performed or isolated from background radiation in a shielded environment (e.g., lead pig).

Structures, Systems, and Components for the DRMI should be, at a minimum, classified as Balance-of-Plant to assure that proper design, operations, and maintenance requirements are assigned to provide for the health and safety of the worker and the environment and to ensure compliance with the other Host Site requirements. Moreover, the DRMI system classification is Mission-Critical (Section 2.2, DOE Standard [STD] 3024-98 [Ref. 5]).

2.0 SYSTEM DESCRIPTION

2.1 Facility, Major Components, and Subsystems

2.1.1 Facility

The DRMI is a group of components and not a facility structure. Normal DRMI operations may be performed in a temporary enclosure or a permanent facility. The detector readout should be located in a shielded area if possible for As Low As Reasonably Achievable (ALARA). If the operation is isolated from drum storage areas and there are low background readings, the operation may be positioned without being placed in a shielded area.

Since this is a mobile system, the facility housing for this measurement operation will not be described, as the DRMI will operate at various sites within the DOE complex. Therefore, this document shall provide the conditions for placement only.

The signal output from the gamma detector will be sent through a cable to the survey meter. The meter may be at a remote control/data collection room adjacent to the measurement room. The length of the cable needed to enable the remote readout location will vary depending upon the site; however, the meter must be calibrated with the length of the cable chosen. Daily operational source checks must be performed on the DRMI. Four dose measurements are performed on each RH waste drum at about 90-degree intervals. The drum will be on a drum turntable, which will rotate to enable the four dose readings.

2.1.2 Unit Description

The Thermo Electron's Model RO-7 survey system is a stand-alone system, which has been designed as a multipurpose unit. Detectors are attached to the digital readout logic unit for handheld survey or fixed application. (Due to the high dose rate of the TRU RH waste, a fixed application is used for RH waste [Ref. 6]).

The digital readout unit senses the range of the detector, which has been connected and indicates the proper units (R/h) and set the proper decimal point placement on the Liquid Crystal Display (LCD). The RO-7 detectors may be attached to the digital readout unit for hand-held survey applications, and may be attached via rigid extensions or flexible cables for remote surveys. These cables can extend the remote capability up to 500 feet from the readout unit.

2.1.2.1 Unit Specifications

RO-7 READOUT/ LOGIC UNIT

- Display:
 - LCD
 - 3 1/2 digits
 - .5 inches high (1.3 centimeter [cm])
 - Includes decimal point, minus sign, high range indication, low battery indication
 - Illumination provided
 - LCD Up-Date Time - The reading is updated about three times per second.
- Response Time:
 - Approximately 2.5 seconds to 90 percent of final reading on all ranges
- Controls:
 - External: on-off switch, zero control, light control
 - Internal: calibration control, battery check
- Battery Complement:
 - Three 9 V NEDA type 1604, two 30 V NEDA type 210
 - Battery Life: 30 V batteries, shelf life; 9 V batteries (C-Zn), 160 – 200 hours
 - Use of display light will shorten battery life
 - Low battery indication is a colon (:) on the LCD
- Readout Construction:
 - Painted aluminum case
 - Size – 9.5 inches high, 4.25 inches wide, 9.5 inches long, (24 cm by 10.8 cm by 24 cm)
 - Weight – 2.7 pounds (1.2 kilogram [kg])
 - Temperature – operational from -20 to 55 °C (-4 to 130 °F)
- All Detectors
 - Power Input: Chamber and amplifier voltages provided by the RO-7
 - Temperature Range from -20 to 160 °F (-30 to 70 °C)
 - Temperature Compensation – detector fully compensated over the temperature range for output accuracy within $\pm 10\%$

RO-7-LD LOW RANGE DETECTOR (GAMMA)

- Range: 1.999 Roentgen per hour (R/h) at full scale.
- Resolution: 0.001 R/h (1 milliRoentgen per hour [mR/h])
- Ion Chamber
 - Aluminum housing, plastic lined, filled with air at atmospheric pressure
 - Aluminum housing thickness is nominally 0.06 inches (1.5 mm).
 - Phenolic liner thickness nominally 0.12 inches (3.2 mm).
 - Chamber dimensions are 1 inch in diameter by 4 inches long (2.5 cm by 10 cm).
 - Chamber active volume: is 50 cm³.
- Detector Dimensions
 - 1.5 inch (3.8 cm) diameter, 7.8 inch (19.8 cm) body length, 8.2 inches (20.8 cm) overall length
 - Weight is 0.58 pounds (0.26 kg)

RO-7-BM MIDRANGE DETECTOR (BETA/GAMMA)

- Range: 199.9 R/h at full scale
- Resolution is 0.1 R/h (100 mR/h)
- Ion Chamber
 - Aluminum housing, plastic lined, thin entry window, filled with air at atmospheric pressure
 - Aluminum housing thickness nominally 0.06 inch (1.5 mm)
 - Phenolic liner thickness nominally 0.12 inch (3.2 mm)
 - Chamber dimensions is 1 inch (2.5 cm) in diameter by 0.6 inch (1.5 cm) long
 - Entry window is 1 inch (2.5 cm) in diameter by 0.6 inch (1.5 cm) thick mylar approximately 7 mg/cm² (1 inch by 0.002 inch)
 - Chamber sensitive volume is 7 cm³
- Dimensions:
 - The basic detector is 1.5 inch (3.8 cm) in diameter by 4.2 inches (10.7 cm) in body length and 4.6 inches (11.7 cm) in overall length
 - The beta shield is 1.6 inches (4.1 cm) long, 1.9 inches (4.8 cm) maximum diameter and adds 0.4 inch (1 cm) to the overall length
 - Weight is 0.48 pounds (0.22 kg) with shield; without shield, 0.39 pounds (0.18 kg)

RO-7-BH High Range Detector (BETA/GAMMA)

- Range: 19.99 kR/h at full scale
- Resolution is 10R/h (10,000 mR/h)
 - Other specifications same as for RO-7-BM
- Standard Cables:
 - RO-7-C15: 15 feet (4.6 meter [m]), 1.5 pounds (0.7 kg)
 - RO-7-C60: 60 feet (18.3 m), 6 pounds (2.7kg)
- Rigid Extensions (aluminum)
 - Tube has an outer diameter of 1 inch (2.5 cm); Mounting flange is 3.5 inches (8.9 cm) square
 - RO-7-RX2: 2 feet (61 cm), 0.82 pounds (0.37 kg)
 - RO-7-RX5: 5 inches (1.5 m), 1.4 pounds (0.64 kg)



2.1.3 Major Components

Major components for the DRMI consist of the following:

- Thermo Electron Corporation RO-7 detector (Ref. 6)
 - Gamma dose rate measurement instrument (Measuring and Test Equipment [M&TE] approved)
 - Ionization chamber probes (RO-7LD and/or RO-7BM)
 - RO-7 Check Source(s)
 - Calibrated Scale (M&TE approved)
 - Scale check weight
 - Drum turntable (Figures 1, 2, 3 and Attachment 1)
 - Standard Instrument Jig that holds the probe at one meter as defined in Attachment B of DOE/WIPP-02-3214(Ref. 2)
 - EXCEL spreadsheet "Waste Container Dose-to-Curie Conversion Record," which is controlled in accordance with CCP-QP-022 (Ref. 7)
 - CCP Software Quality Assurance Plan
 - Power: 120 V Alternating Current (AC)
- Instrument Support Equipment
 - Instrument fixture for placement of the detectors adjacent to the waste drums.
 - The "footprint" of the fixture is not to exceed a maximum of 3 feet by 5 feet, and will not interfere with locating the face of the detectors at 3.28 feet (1 m) from the surface of a 55/85 gallon drum, plus the height of the rotating turntable (Figures 1, 2, 3, and Attachment 1).
 - The drum to be measured will be sitting on a rotating turntable that will be a minimum of approximately 8 inches high, with a potential upper limit of 2 feet.

2.1.3.1 Turntables

There are two types of turntables that may be used in this process. The Rotator Table is a VUEMore Mfg. Corp., 30 inch Model HD207-2, Dual Motor, Friction drive diameter Heavy Duty Turntable, Single Motor Drive is used to rotate a 55/85 gallon drum. The top surface of the turntable has a diameter of 30 inches. The base of the turntable is 30 inches by 30 inches and the top of the turntable is 9-1/2 inches from the surface level. Drum centering blocks 120 degrees apart maintain the drum in position during rotation. A single drum is placed on the turntable and rotates to enable dose readings.

- CCP-659 RH-TRU Assay GSS-NCD-1, Turntable configuration, Plan, Elevation, and details drawing 635364, Sheet 1 of 3
- VUE-MORE MFG. Corp. Nutley, N.J., Model HD-207-2, Dual Motor, with Friction Drive, drawing un-number, dated, October 3, 1995
- VUE-MORE web page: <http://vue-more.com/>

Specification:

- Single drive unit – 1,000 pound capacity
- 220 V operations

ORTEC® ISO-TURNABLE -110 ROTATOR TABLE

Forklifts or handtrucks are needed to safely position the drum on the center of the platform. The height of the platform above the floor is 10 inches. No additional electronic noise is introduced into the high purity germanium detector signal processing (See Attachment 3).

Specification:

- For 30 or 55 gallon drums
- 30-inch diameter turntable
- 30 by 30-inch support base
- 1,000 pounds (454 kg) weight capacity
- 1 RPM rotation speed

ISO-TURNABLE-110 110 V, 60 HZ

- Shipping Weight: 200 pounds
- Ordering Information/Model Description (www.ortec-online.com/pdf/turntable.pdf)

2.2 Electrical Power

The DRMI Instrument may be powered by 120 V-AC or battery operated. The ISO-Turntable-110 required 110V, 60Hz. The VUE-More Mfg. Corp., 30 inch Model HD207-2, requires 220 V.

All electrical equipment shall be tested and listed by National Recognized Testing Laboratory, such as Underwriters Laboratory.

3.0 DESIGN REQUIREMENTS

3.1 Specific Requirements

While quantitative design requirements have not been identified for the DRMI, the system must be capable of assuring that fissionable material in its inspected drums does not exceed that permitted by the WIPP WAC (Ref. 1). The facility at which the DRMI operates must also establish that the system, in its site-specific implementation, meets 10 CFR 830 (Ref. 10), 10 CFR 835 (Ref. 11), and other requirements applicable to that site.

3.2 Codes and Standards

While codes and standards have not been identified as design requirements, a number of codes and standards (briefly described below) have been used in the “as-built” system and are identified, where applicable.

- Radiation Surface Dose Rate

WIPP Land Withdrawal Act (LWA) Requirement. The LWA defines “remote-handled transuranic waste” as TRU waste with a surface dose rate of 200 mrem/hr or greater. The LWA prohibits the receipt of TRU waste with a surface dose rate in excess of 1,000 roentgen equivalent, man per hour (rem/hr), and no more than 5 vol. % of the RH TRU waste received at the WIPP may have a surface dose rate in excess of 100 rem/hr.

Acceptance Criterion. The external radiation dose equivalent rate of individual payload containers shall be greater than, or equal to, 200 mrem/hr and less than, or equal to, 1,000 rem/hr at the surface of the payload container. The total dose equivalent rate and the neutron contribution and associated uncertainty shall be reported in the WIPP Waste Information System for each payload container. The WIPP will track the dose rates and volumes of containers, using WIPP Waste Information System, to ensure that no more than 5 vol. % of the RH TRU waste received at the WIPP has a surface dose rate in excess of 100 rem/hr.

- WIPP LWA, *Waste Isolation Pilot Plant Land Withdrawal Act of 1992* (Pub. L. 102-579, 106 Stat. 4777)
- CFR 29, *Occupational Safety and Health Standards, Subsection 1910.119, Hazardous Materials*, Code of Federal Regulations, U.S. Department of Energy, Washington, DC, July 2005.CCP-TP-045, *CCP RTR #5 Radiography Inspection Operating Procedure*
- National Fire Protection Association (NFPA) 70, *National Electrical Code*, 2005 Edition

- American National Standards Institute (ANSI) Standard N323, *Radiation Protection Instrumentation Test and Calibrations*
- 40 CFR Part 194, *Criteria for the Certification and Re-certification of the Waste Isolation Pilot Plant's Compliance with 40 CFR Part 191 Disposal Regulations*
- 40 CFR Part 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level and Transuranic Radioactive Wastes*

4.0 OPERATIONAL INFORMATION

4.1 System Control Features

4.1.1 Emergency Shutdown Devices

Because this equipment operation is a passive gamma scanning of drums, the equipment may be started or stopped at any time without undue risk to the equipment or personnel. All equipment can be remotely de-energized without entering the examination area.

4.1.2 Fire Protection

Fire protection will be provided by the Host Site where the equipment operates. Therefore, fire protection systems and equipment that may be available at a given Host Site are not described in this document. Host Safety Management Programs such as Site Emergency Response Program and Radiological Control Program establish what actions should be taken to recover from a fire event.

4.1.3 Radiation and Other Hazards

The DRMI is a passive gamma scanner system that does not generate any radiation. The Personal Protective Equipment (PPE) for normal handling operations is leather gloves when handling drums, safety shoes, and required dosimetry. Additional PPE may be used such as work coveralls, hard hats, and safety glasses. PPE for abnormal conditions shall be specified by the applicable Host Site programs/procedures or addressed in the Host Site Work packages or permits. PPE is worn before starting any operations. Workers who will be working in a radiation area must have read and signed the applicable host site procedures/paperwork, and received orientation to applicable work package.

Containers of RH TRU waste must be handled in a manner consistent with procedures and ALARA. Surface dose equivalent rates (dose rates) could be equal to, or greater than, 200 mrem/hr; therefore, waste handling should be pre-planned to maintain ALARA. All TRU waste must be handled in a manner that protects operators and others from inhalation or ingestion of radionuclides. To do this, waste characterization activities are performed in facilities designed to contain airborne radionuclides that may result from sampling or testing. For RH TRU waste, the testing or sampling may require hot cell facilities that provide remote-handling capability and extensive shielding.

The RH TRU waste characterization program will include the quantification and tracking of unique waste properties that are required by the LWA. These include verification that surface dose rates are below 1,000 rem/hr for all containers, tracking of dose rate information to ensure that no more than five percent of the containers disposed exceed

100 rem/hr, determination of activity concentration in Curies per liter (Ci/l), ensuring that each container is less than, or equal to, 23 Ci/l, and verification that container dose rates are equal to, or greater than, 200 mrem/hr. Due to the limitations imposed by the higher gamma radiation fields, Non-Destructive Assay of waste containers will not be used as extensively in the RH TRU program as it is in the Contact Handled TRU waste characterization program.

4.1.4 Nuclear Criticality Safety

The DRMI processes one drum on the turntable at a time. The Host site is responsible for analyzing the DRMI processes one drum on the turntable at a time. The Host site is responsible for analyzing required controls for criticality prevention based on site-specific programs for inventory control and TRU waste management operational practices.

4.1.5 Industrial Hazards

The most common industrial hazards associated with systems are as follows:

- Voltages (DTC Survey System and Drum Turntable)
 - Hazard
 - Electrical hazards, including severe shock, could occur while performing any repair work on the DTC survey system related electrical equipment.
 - Controls
 - Electrical components and installation meet NFPA 70, National Electric Code.
 - Electrical supplies are properly labeled.
 - Maintenance and repair work shall be performed on de-energized equipment by personnel having completed the appropriate training. If it is determined that work must be performed on energized equipment, safety precautions and the appropriate site electrical safety work permits shall be followed.
- Pinch Points (Rotating equipment)
 - Hazard
 - The drum turntable has moving parts.
 - Control
 - Warning labels shall be placed on equipment to warn operators.
 - Equipment design shall include guards and covers to prevent hazard.
- Material Handling
 - Hazards
 - Due to the large size and weight of the drums, potential for personnel injury and/or equipment damage exists.
 - Potential hazards when handling drums include pinch points, hand and foot injuries, breached drums, and releases.

- There are hazards associated with sharp edges or points with hand tools.
- Controls
 - Material handling aids (e.g., cranes, fork trucks, drum lifts, drum carriers, castors, ramps, or hoists) shall be used whenever practical.
 - All movement and handling of drums, which require forklift or cranes, will be performed by Host Site personnel.
 - Personnel handling heavy items or containers (e.g., drums) shall wear appropriate PPE. At the minimum, PPE for material handling shall include safety shoes; heavy gloves (e.g., leather) are required for handling drums.
 - Walking and working surfaces shall be maintained in a clean and undamaged condition so as not to impede materials handling activities.

5.0 REFERENCES

1. DOE/WIPP-02-3122, *Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC)*.
2. DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan (WCPIP)*.
3. DOE-STD-3024-98, *Content of System Design Descriptions*.
4. *Thermo Electron Corporation Product Specification for Model R0-7 High Range Survey System*, www.thermo.com/rmp.
5. CCP-CM-001, *CCP Equipment Change Authorization and Documentation*
6. CCP-QP-002, *CCP Training and Qualification Plan*.
7. CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*
8. CCP-QP-022, *CCP Software Quality Assurance Plan*.
9. CCP-TP-140, *CCP Equipment Maintenance*.
10. 29 CFR 1910.119, *Occupational Safety and Health Standards, Hazardous Materials*, Code of Federal Regulations, U.S. Department of Energy, Washington, DC.
11. *Nuclear Safety Management*. Code of Federal Regulations, Title 10 Part 830, U.S. Department of Energy, Washington, DC.
12. Title 10 Energy, Part 835, *Occupational Radiation Protection*. U.S. Department of Energy, Washington, DC.

Attachment 1 – Equipment Setup Requirements

Central Characterization Project (CCP)

Mobile Characterization Unit (MCU) Installation Specifications

Equipment: Remote Handled TRU Waste Dose Rate Measurement Instrument (RH-DTC-RHAT-01)

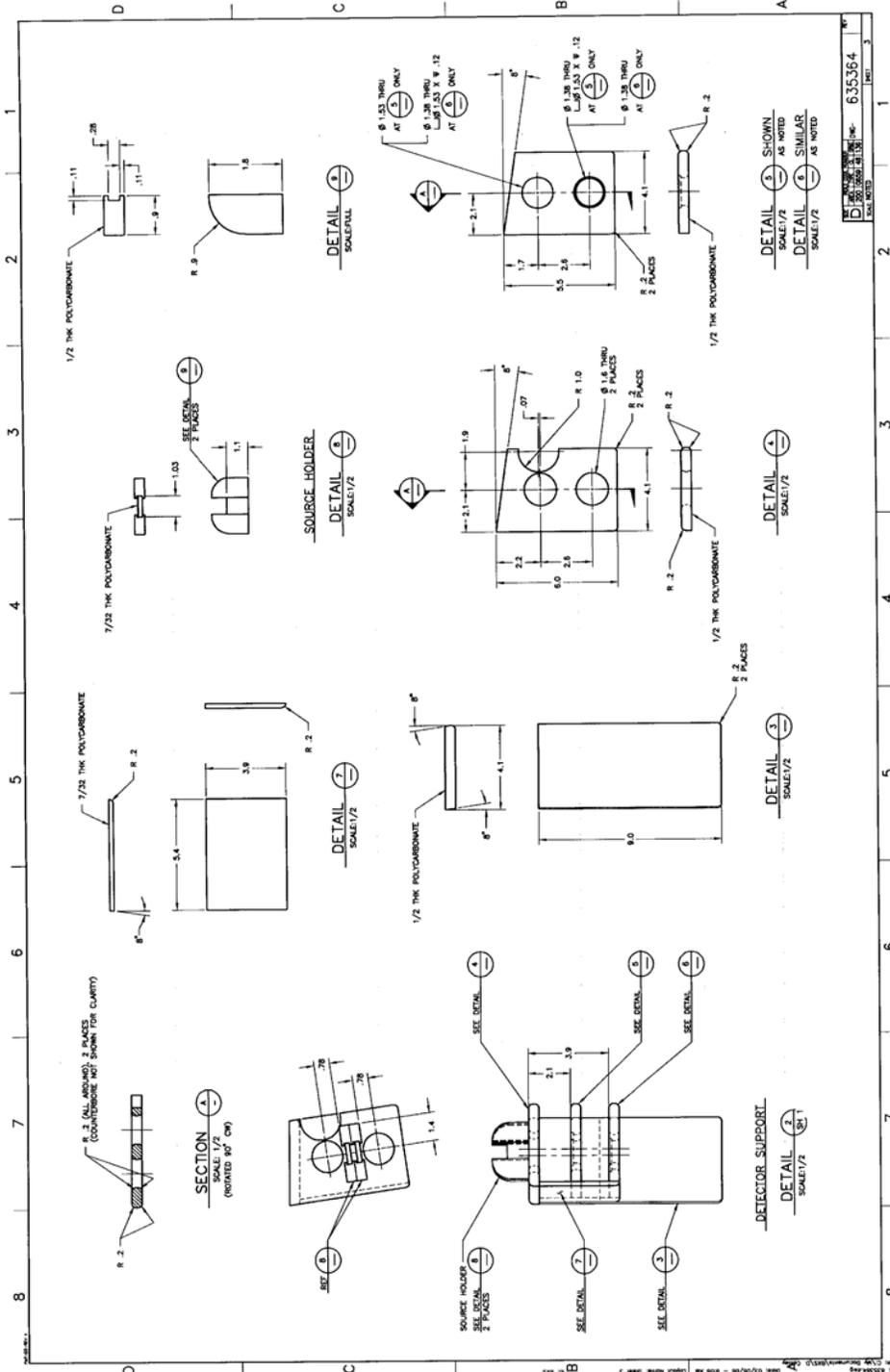
Summary: Table A contains information regarding general site installation and preparation information for the DRMI DTC system MCU.

Table A Installation Specifications	
Weight (nominal values)	Approx. total weight – 225 pounds with 1000lb capacity
Primary Electrical Requirements (including overcurrent protection and grounding)	DRMI – 120 VAC or battery ISO Turntable – 110V, 60 Hz VUE-More Mfg. Corp. 30 inch model HD207-2-220V
Fire Suppression	N/A
Communication	N/A
Footprint	6 feet by 3 feet (6' x 3')
Anchoring Points	N/A

CCP-CM-012, Rev. 0 CCP Remote-Handled Transuranic Waste Dose Rate Measurement Instrument (DRMI) Equipment #RH-DTC-RHAT-01 Equipment Description

Effective Date: 05/14/2007

Attachment 2 – Drawings (Continued)



EQ #: RH-DTC-RHAT-01

Attachment 3 – CCP Characterization Equipment Change Authorization 5/30/2006

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Attachment 1 – CCP Characterization Equipment Change Authorization

SECTION A - Change Description

Characterization Equipment Description and/or Equipment Number: RH-DTC-RHAT-01
Dose Rate Measuring System (DOE/WIPP 5022001)

Characterization Equipment Location: Host Facility Argonne National Laboratory - East

Proposed change (attach redline drawings if available): cut 2 7/16" wide slots in the
polycarbonate detector support to allow 2 RO-7 detectors with flexible cables
connected to be placed in detector cradle. (See attached illustration)

SECTION A1 – Screening/Impacts

Screening Questions:

1. Does the proposal change the description of equipment or systems found in the BIO? Yes _____ No X
2. Could the proposal affect the current certification of NDE, NDA, HSG or VE Systems? Yes _____ No X
3. Does the proposal result in a change to equipment or CCP Technical Baseline Documents? Yes X No _____

Impacted CCP documents/procedures/drawings (attach redline pages of each document/ procedure/drawings). Write "NONE" if no impacts.

Idaho Cleanup Project CPP-659 Sheet 1

Idaho Cleanup Project CPP-659 Sheet 3

VPM:

F. Wesley Root
Printed Name

F. Wesley Root
Signature

5-22-06
Date

CCP-CM-012, Rev. 0
CCP Remote-Handled Transuranic Waste Dose Rate
Measurement Instrument (DRMI) Equipment #RH-DTC-RHAT-01
Equipment Description

Effective Date: 05/14/2007

Attachment 3 – CCP Characterization Equipment Change Authorization 5/30/2006
(Continued)

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CCP-CM-001, Rev. 1 Effective Date: 12/20/2005
CCP Equipment Change Authorization and Documentation Page 16 of 19

Attachment 1 – CCP Characterization Equipment Change Authorization (Continued)

SECTION B - Designated Reviewers

YES	NO	Notify Only	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	SPM <u>Larry Porter</u>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	STR <u>Jim Frego</u>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CCP Manager
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other: <u>Russell Leach CME</u> (e.g., Authorization Basis, Rad Engineer, ES&H) <u>Other Scott Burns</u>

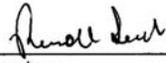
Review Completion Date: 5/30/06

Designated Reviewer: Russell Leach
Printed name

SECTION C - Review Comments

None

Approve Disapprove

Designated Reviewer: 
Signature

Title: CME

Date: 5/30/06

CCP-CM-012, Rev. 0
CCP Remote-Handled Transuranic Waste Dose Rate
Measurement Instrument (DRMI) Equipment #RH-DTC-RHAT-01
Equipment Description

Effective Date: 05/14/2007

Attachment 3 – CCP Characterization Equipment Change Authorization 05/30/2006
(Continued)

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CCP-CM-001, Rev. 1 Effective Date: 12/20/2005
CCP Equipment Change Authorization and Documentation Page 16 of 19

Attachment 1 – CCP Characterization Equipment Change Authorization (Continued)

SECTION B - Designated Reviewers

RH-DTC-RHAT-01

YES	NO	Notify Only	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SPM
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	STR
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CCP Manager
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other: <u>Scott Burns</u> <u>Project Office Engineer</u> (e.g., Authorization Basis, Rad Engineer, ES&H)

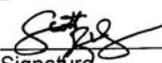
Review Completion Date: 5/30/06

Designated Reviewer: Scott Burns
Printed name

SECTION C - Review Comments

None

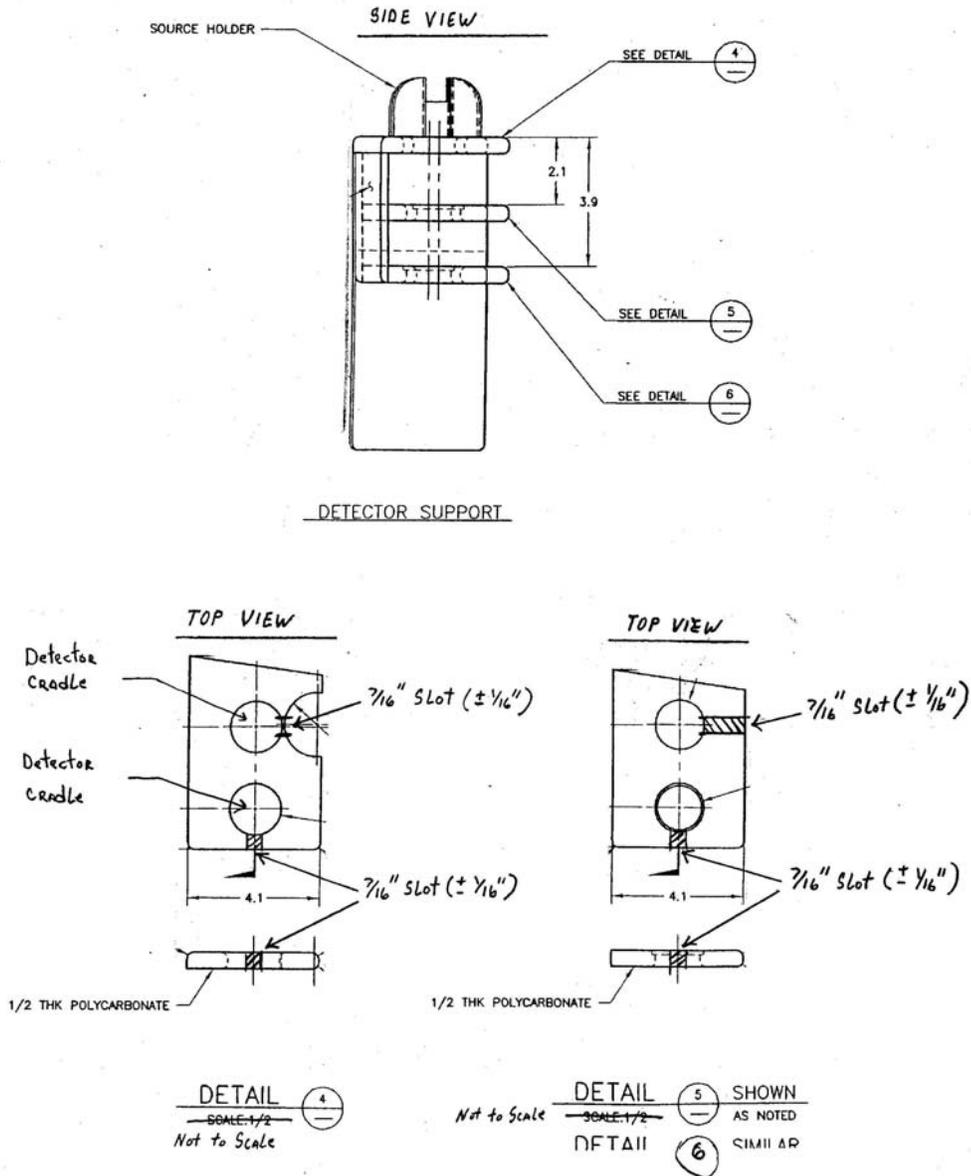
Approve Disapprove

Designated Reviewer: 
Signature

Title: Project Office Engineer

Date: 5/30/06

Attachment 3 – CCP Characterization Equipment Change Authorization 05/30/2006
(Continued)



- Note 1 - 7/16-inch wide Slot extends from outside edge of Support to detector cradle hole.
- Note 2 - Round and smooth edges of cut
- Note 3 - dimension tolerance - width of slot will be within 1/16 of inch of the 7/16-inch specification.

Proposed Change to detector support on
Dose Rate Measuring System (RH-DTC-RHAT-01)
Illustration from Sheet 3 of Drawing 635364
VPM: F. Wesley Root Date: 5-18-06

Attachment 3 – CCP Characterization Equipment Change Authorization 05/30/2006
(Continued)

Controlled
Copy

Attachment 1 – CCP Characterization Equipment Change Authorization (Continued)

SECTION E - Disposition of Change

- Proceed with change, no bid or certification impacts
- Do **NOT** proceed with change
- Proceed with change, BIO change required
- Proceed with change, recertification activity required
- Proceed with change, procedure change required
- Proceed conditionally as described below

CCP PM:

Eric D'Amico
Printed name


Signature

Date: 5/30/06

Attachment 4 – Photos



Attachment 4 – Photos (Continued)



Attachment 4 – Photos (Continued)



Attachment 5 – RO-7 Specifications

Thermo Electron's RO-7 Survey System has been designed as a multipurpose unit. Detectors are attached to the digital readout logic unit for hand-held survey applications.

Product Specifications

Model RO-7
High range survey system



- High range
- Up To 20,000 R/h Gamma
- Up To 20,000 Rad/h Beta
- Digital Readout
- Automatic Decimal Point Placement
- Waterproof Probe Housing For Underwater Surveys



The RO-7 detectors may be attached to the digital readout unit for hand-held survey applications, and may also be attached via rigid extensions or flexible cables for remote surveys. These cables can extend the remote capability up to 500 feet from the readout unit.

Three detectors are available to provide a wide detection range. All three detectors will operate in the RO-7-UWH (Underwater Housing) for pool or other underwater surveys to depths of up to 60 feet.

The intelligent digital readout unit senses the range of the detector which has been connected and indicates the proper units (R/h, kR/h) and sets the proper decimal point placement on the liquid crystal display (LCD). A blinking arrow on the LCD

indicates the connection of the high range detector (RO-7-BH).

Available Accessories

A single aluminum absorber, Model YP10950108, can be used to estimate beta energy (E_{max}) in three ranges as follows: below 0.5 MeV, 0.5 to 1.5 MeV, and over 1.5 MeV. With this straight forward method of estimating beta energy within one of these ranges, a better evaluation can be made on the effectiveness of clothing for shielding and also a determination can be made on the type of personnel dosimetry that will be required. Also, a more accurate estimate of beta absorbed dose rate can be made taking into account the beta energy.

Attachment 5 – RO-7 Specifications (Continued)

RO-7 Specifications

RO-7 Readout/ Logic Unit

Display: Liquid crystal (LCD), 3 1/2 digits, 5" high (13 cm).

Includes units, decimal point, minus sign, high range indication, low battery indication. Illumination provided.

LCD Up-Date Time: The reading is updated about three times per second.

Response Time: Approximately 2.5 seconds to 90 percent of final reading on all ranges.

Controls:

External: On-Off Switch, Zero Control, Light Control

Internal: Calibration Control, Battery Check

Battery Complement: Three 9 V NEDA 1604, two 30 V NEDA 210
Battery Life: 30 V batteries, shelf-life; 9 V batteries (C-Zn), 160 hours. Use of display light will shorten battery life. Low battery indication is a colon (:) on the LCD.

Construction: Painted aluminum case

Size: 9.5" H, 4.25" W, 9.5" L, (24 cm x 10.8 cm x 24 cm)

Weight: 2.7 lbs. (1.2 kg)

Temperature: Operational from -20 to 55 °C (-4 to 130 °F)

All Detectors

Power Input: Chamber and amplifier voltages provided by the RO-7

Temperature Range: -20 to 160 °F (-30 to 70 °C)

Temperature Compensation: Detector fully compensated over the temperature range for output accuracy within ±10%.

RO-7-LD Low Range Detector (gamma)

Range: 1.999 R/h at full scale. Resolution: 0.001 R/h (1 mR/h)

Ion Chamber: Aluminum housing, plastic lined, vented to atmosphere. Aluminum housing thickness nominally 0.06" (1.5 mm). Phenolic liner thickness nominally 0.12" (3.2 mm).

Chamber dimensions: 1" dia x 4" long (2.5 cm x 10 cm).

Chamber sensitive volume: 50 cm³.

Detector Dimensions: 1.5" (3.8 cm) diameter, 7.8" (19.8 cm) body length, 8.2" (20.8 cm) overall length.

Weight: 0.58 lbs (0.26 kg)

RO-7-BM Midrange Detector (beta/gamma)

Range: 199.9 R/h at full scale.

Resolution is 0.1 R/h (100 mR/h)
Ion Chamber: Aluminum housing, plastic lined, thin entry window, vented to atmosphere. Aluminum housing thickness nominally 0.06" (1.5 mm). Phenolic liner thickness nominally 0.12" (3.2 mm).

Chamber dimensions: 1" (2.5 cm) diameter x 0.6" (1.5 cm) long.

Entry window: 1" (2.5 cm) diameter x 0.6" (1.5 cm) thick mylar approximately 7 mg/cm² (1" x 0.002"). Chamber sensitive volume: 7 cm³.

Beta Response: When the detector is calibrated with ¹³⁷Cs, the difference in the readings with the beta shield off and on is multiplied by 1.1 to convert the observed readings to rad/h beta. This beta factor is based upon calibration to a ⁹⁰Sr/⁹⁰Y source. The beta factor ranged from 1.0 at 11 cm from the source, to 1.2 at 50 cm from the source. The beta factor ranges from 1.0 to 2.0 for most beta emitters.

Beta Shield: Friction held plastic cap, approximately 1000 mg/cm² over beta window.

Dimensions: The basic detector is 1.5" (3.8 cm) diameter x 4.2" (10.7 cm) body length and 4.6" (11.7 cm) overall length. The beta shield is 1.6" (4.1 cm) long, 1.9" (4.8 cm) maximum diameter and adds 0.4" (1 cm) to the overall length.

Weight: 0.48 lbs (0.22 kg) with shield. Without shield, 0.39 lbs (0.18 kg)

RO-7-BH High Range Detector (beta/gamma)

Range: 19.99 kR/h at full scale.

Resolution is 10 R/h
Other specifications same as for RO-7-BM.

RO-7-UWH Underwater Housing

Maximum Depth: 60' (18.3 m)

Materials: Stainless steel. Joint sealed with two O-rings and cable sealed with two rubber glands.

Wall Thickness: 0.06" (1.6 mm) in ion chamber region

Dimensions: 1.75" (4.5 cm) diameter x 30" (76 cm)

Weight (excluding cable): 6.13 lbs (2.8 kg)

Cable: Length: 60" (18.3 m), Weight: 6 lbs (2.7 kg)

Standard Cables

RO-7-C15: 15' (4.6 m), 1.5 lbs (0.7 kg)

RO-7-C60: 60' (18.3 m), 6 lbs (2.7 kg)

Rigid Extensions (aluminum)

Tube O.D., 1" (2.5 cm). Mounting flange, 3.5" (8.9 cm) square

RO-7-RX2: 2' (61 cm), 0.82 lbs (0.37 kg)

RO-7-RX5: 5' (15 m), 1.4 lbs (0.64 kg)

Photon Response VS Energy:

When the RO-7-BM and RO-7-BH detectors are used with the beta shield on, and the end of the detector pointed to the radiation source, the response nearly equals the conversion factors for computing dose equivalent (rem) from exposure (R) in air as specified in the October 1981 draft of the ANSI N13.11 "Criteria for Testing Personnel Dosimetry Performance".

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Attachment 6 – Turntable Specifications

ORTEC[®]

ISO-TURNTABLE

**Rotate Your Drum
to Reduce Your Measurement Bias**



Most waste measurements are nonhomogeneous and measurement accuracy will be reduced if activity is not evenly distributed throughout the drum. Rotating the drum will make the item “appear” more homogeneous to the detector. When using Program Isotopic, the uncertainty in matrix attenuation will be reduced. Thus, the reported answers will reflect an overall measurement uncertainty improvement (reduction).

Forklifts or handtrucks are needed to safely position the drum on the center of the platform. The height of the platform above the floor is 10 inches. No additional electronic noise is introduced into the HPGe detector signal processing.

- For 55 or 85 gallon drums
- 30-inch diameter turntable
- 30 x 30-inch support base
- 1000 lbs (454 kg) weight capacity
- 1 RPM rotation speed

Ordering Information

Model	Description
ISO-TURNTABLE-110	110 V, 60 Hz
ISO-TURNTABLE-240	240 V, 50 Hz

Options

ISO-TURNTABLE-OPT1	Increase in RPM
ISO-TURNTABLE-OPT2	Wireless On/Off
ISO-TURNTABLE-OPT3	Power Cord Extension
ISO-TURNTABLE-OPT4	Switch Cable Extension

Specifications subject to change
013106

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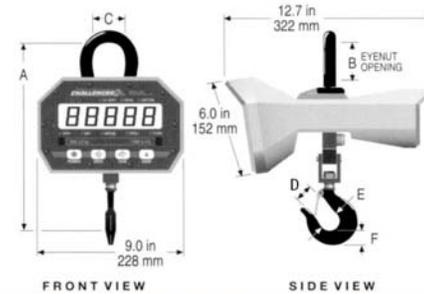
Tel. (965) 482-4411 • Fax (965) 483-0396 • info@ortec-online.com
801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A.
For International Office Locations, Visit Our Website

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ADVANCED MEASUREMENT
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Attachment 7 – Scale Specifications

MSI-3360 Challenger 2 Specifications and Dimensions

The MSI-3360 crane scale is an ideal unit for the cost conscious user for light capacity use. For higher capacities, heavy-duty, outdoor and continuous production use, MSI recommends MSI-4260, MSI-4300, MSI-6260CS or MSI-9300.



CAPACITY	RESOLUTION**	A	B	C	D	E	F	APPROX. SHIP WT.
250 lb	0.1 lb	11.94 in	2.45	2.00	1.12	1.63	1.12	22 lb
125 kg	.05 kg	303 mm	62.0	51.0	28.0	41.0	28.0	10 kg
500 lb	0.2 lb	11.94 in	2.45	2.00	1.12	1.63	1.12	22 lb
250 kg	0.1 kg	303 mm	62.0	51.0	28.0	41.0	28.0	10 kg
1,000 lb	0.5 lb	11.94 in	2.45	2.00	1.12	1.63	1.12	22 lb
500 kg	0.2 kg	303 mm	62.0	51.0	28.0	41.0	28.0	10 kg
2,000 lb	1 lb	11.94 in	2.45	2.00	1.12	1.63	1.12	22 lb
1,000 kg	0.5 kg	303 mm	62.0	51.0	28.0	41.0	28.0	10 kg
5,000 lb	2 lb	16.67 in	3.40	2.45	1.80	2.50	1.81	39 lb
2,500 kg	1 kg	423 mm	86.0	62	46.0	64.0	46.0	18 kg
10,000 lb	5 lb	16.67 in	3.40	2.45	1.80	2.50	1.81	39 lb
5,000 kg	2 kg	423 mm	86.0	62	46.0	64.0	46.0	18 kg
15,000 lb	5 lb	21.58 in	4.28	3.25	1.95	3.00	2.25	67 lb
7,000 kg	2 kg	548 mm	109	83	50	76	57	30 kg

CONSULT FACTORY FOR HIGHER CAPACITIES

Standard Product Specifications

- Accuracy:** Plus or minus 0.1% of applied load
- Display:** 5 digit, 1.2 in/30mm high manual or photocell LED brightness control
- Filtering:** Low, Medium or High selectable
- Units:** Pounds or Kilograms selectable
- Resolution:** 2000 or 2500 divisions standard (up to 10,000 available)
- Power:** 6 volt rechargeable battery (115 or 230 VAC charger included)
- Operating Time:** 50 - 100 hours depending on operating mode
- Auto-Off Mode:** Select for 12 minutes, 1 hour or Off
- Auto-Sleep Mode:** Power down during non-use and power up with motion for maximum battery conservation
- Service Counter:** Registers number of lifts by value for inspection and maintenance reminder
- Operating Temperature Range:** -4° to +122°F (-20° to +50°C)
- Enclosure:** NEMA 12 IP54 powder coated Alodined Cast Aluminum
- Hook:** Crosby-Laughlin or equivalent 360° non-bearing swivel
- Safe Overload:** 200% of rated capacity
- Ultimate Overload:** 500% of rated capacity

Function Switches and Lights

- POWER:** Turns unit ON or OFF
- ZERO:** Zeros applied load up to 100% of capacity (limited range with NIST or OIML option)
- TARE:** Tares out applied load and displays weight in Net mode. Push again to return to Gross mode
- USER:** User programmable multifunction switch for use as TEST, UNIT select, TOTAL (auto or manual), PEAK HOLD and SET POINTS
- ANNUNCIATORS:** Center of Zero, Net, Gross, Total, Peak, x 1000, Battery, lb/kg, Motion, SP1 and SP2

Options and Accessories

- NTEP (86-021A2), OIML and EC (T2943) approved versions (Contact factory for specifications)
- Infrared remote controller with 8 meter operating range
- RS-232 data output with connector
- Universal direct power supply
- Audible setpoint alarm
- Special capacity or displayable resolution

Other Heavy-Duty MSI Crane Scales

For heavy-duty, high heat or hazardous use applications, See MSI-4260 Porta-Weigh specification sheet.

Capacities from 500 lb to 500,000 lb (250kg to 250,000kg).

For heavy-duty and multi-task applications, See MSI-4300 Porta-Weigh Plus specification sheet.

Capacities from 500 lb to 500,000 lb (250kg to 250,000kg).

For heavy-duty applications requiring remote radio telemetry display and/or remote computer/printer interface, see MSI-9300 Porta-Weigh Plus specification sheet.

Capacities from 500 lb to 500,000 lb (250kg to 250,000kg).

"We weigh quality first"

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