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|  | | Nuclear Engineering and Nonproliferation (NEN)  Safeguards Science and Technology (NEN-1) | | |
| Title: | **Source Tracker Software Design** | | | |
| Number: **NEN1-ST-SD** | | | Revision: 3.1 | Page 1 of 30 |

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**History of Revisions**

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| **Revision Number** | **Approval Date** | **Change Description** |
| Revision 1.0 | 01/29/08 | Original Issue |
| Revision 1.1 | 2/25/08 | N changed to STOFOD; reference DAR; standard history of revisions table; changed font to Arial; added List of Figures; and minor wording changes. |
| Revision 1.2 | 3/4/08 | Added pseudocode for SR1.7 and SR 7.7; updated pseudocode for SR 15.4; added SR1.6 notations in 3 places |
| Revison 2.0 | 8/27/15 | Computer hardware/software upgrades. |
| Revision 3.0 | 11/18/2015 | Addition of all email design for alerts and reports. |
| Revision 3.1 | 2/8/2016 | Update for new version. |

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# Introduction

## System Design Document Objectives

The main objective of this design document is to provide detailed specifications on how each item under § 3.2 *Functional Requirements*, § 3.3 *Performance Requirements,* § 3.4 *System and Communication Requirements* and § 3.5 *System Security Requirements* § 3.5 *Back-up and Recovery Requirements* of the *Source Tracker Software Requirements Specification* (NEN1-ST-SRS) are programmatically accomplished.

In addition to this objective, the new version of ***Source Tracker*** should, as much as possible, mimic the user display and overall look and feel of the previous software. Doing so will ease training requirements and make for an easier transition to the new product.

## System Description and Objectives

This ***Source Tracker*** software is designed for tracking of certain classes of radioactive source items by authorized users in the NEN Groups. Users include authorized custodians and NEN division researchers.

A typical installation has multiple remote stations or clients, all connected to a master database server.

The basic hardware architecture for a remote station, or client, is shown in Figure 1. A computer with a bar code reader, a touch screen, a CPU and a hard drive receives input from users, executes the ***Source Tracker*** software in response to user operation. The computer is also connected via the LANS yellow network to a central Server machine. See §§ 2.1.1 and 3.8 of the *Source Tracker Software Requirements Specification* (NEN1-ST-SRS).



Figure 1 System Hardware Architecture

The basic system software architecture is shown in Figure 2. The ***Source Tracker*** software is a Windows application that interacts with the user through the touch screen display, reads input from the bar code reader and touch screen, and writes results to a central database. There are currently multiple Source Tracker workstations deployed. More ***Source Tracker*** application details appear later in this document.

The organizing foundation of ***Source Tracker*** client software is the database design. All data representation for source items, users, and source events is defined in the database, using tables, fields and relationships. The database is a SQL Server 2014 compatible database system implemented in a single database file. The database structure supports source description and characterization, as well as tracking the source location and the controlling user for each source. All events involving sources are recorded as database transactions.

SourceTracker.exe  
(instances on workstations)

User Interface Assembly

Query /  
Transaction Request

DB Assembly

SQL DB

Query /  
Transaction Result

Calculation Assembly

Calculation Result

Report/  
Notification Assembly

Report/  
Notification Result

Notification /  
Stored Procedure

Report/  
Notification

Figure 2 System Software Architecture

## Definitions and Acronyms

Definitions and acronyms are found in the *Source Tracker Definitions, Acronyms, and References* document (NEN1-ST-DAR).

## References

References are found in the *Source Tracker Definitions, Acronyms, and References* document (NEN1-ST-DAR).

# System Design

## System Architecture

The overall architecture is already described by Figure 2, above. A more detailed description of the architecture of the program is provided in Figure 3.

Source Tracker

DB

UI

Calculations

Data Structures

Utilities

SQL Database

Email

Figure 3 Deployed Component Architecture

## Hardware

The software runs on a server PC with an installed Ethernet port, USB port, and touch screen. Users do not have access to a keyboard/mouse under normal operating conditions.

## Data Communications

A user inputs data to ***Source Tracker***, and generally controls ***Source Tracker***, using the bar code reader and touch screen. Additional data communication occurs across the network when a user logs into a client, causing authorization requests to occur over the network with the Windows network domain controller, and the SQL Database generates reports and notifications using stored procedures that are routed via email from the database.

## Software

The ***Source Tracker*** software consists of a single Windows executable. During execution, ***Source Tracker*** reads and writes to the central SQL server that responds to user commands through forms and displayed to the user on the touch screen, and receives input from the bar code reader when identifying users and sources.

## Architecture Diagram

Classes / Source / User / Location / Nuclear Data/ CritAndFuelRodLimits/ LogEntry

Touch Screen / Barcode Reader / Network

SQL

Windows App Event

User Forms /

Buttons / Pages / Tables

SQL Server

Figure 4 Top Level Architecture

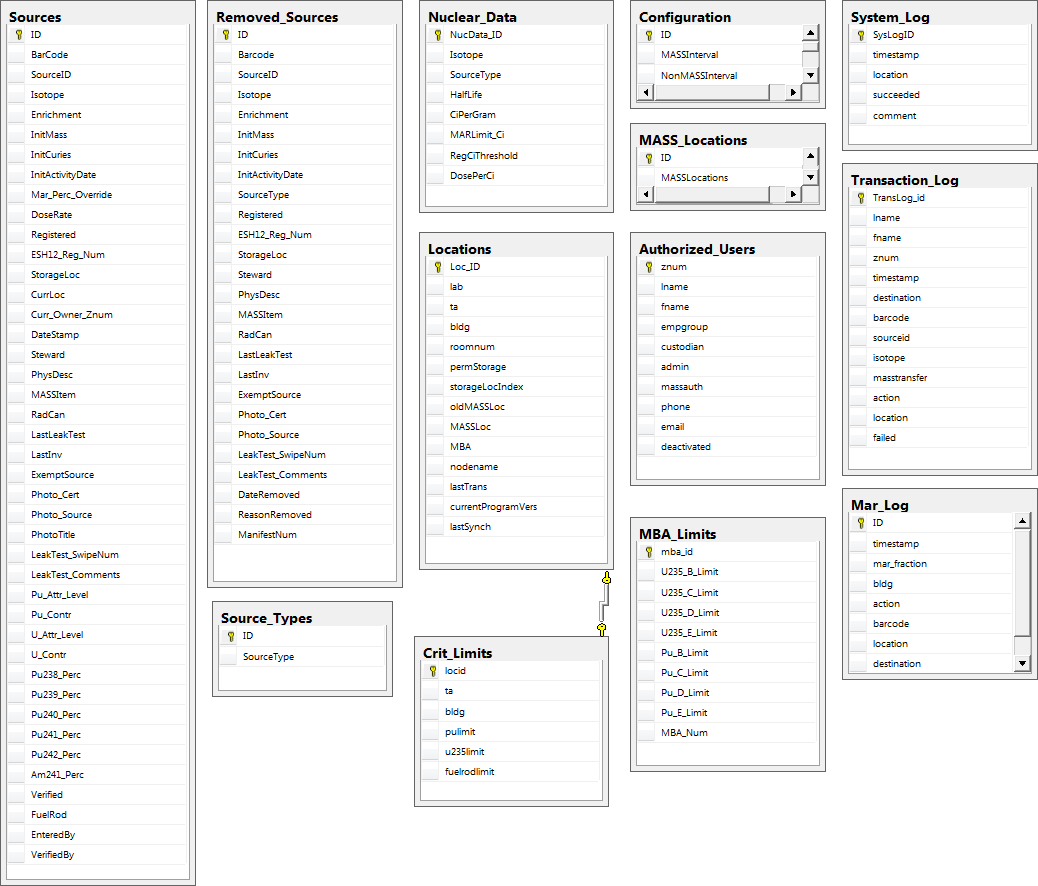


Figure 5 Database Tables, Relationships and Fields

## Data Design

The data design is the database itself. See Figure 5 (above) and the detailed description of each database table in appendix A (below). Sources are described by several attributes. All data necessary for ***Source Tracker*** operations are contained in the database with the exception of the database connection string and the workstation location (stored locally on workstations).

## Data Objects and Resultant Data Structures

At run time, ***Source Tracker*** builds internal C # class representations of the database tables into the immediate memory space of the application, using database support API components from Microsoft, and specialized structures for the type of data represented by the database tables. For example, a list of User objects is constructed from the Authorized Users table entry, which can be further filtered to only contain Custodians or Administrators. The software then uses this in-memory copy of the database state to respond to user actions. Data structures are populated in response to queries and commands from the user and are accessed in real-time.

## File and Database Structures

### **Files to be Read**

These configuration files are read by ***Source Tracker***:

* SourceTracker.exe.config – Contains database connection and location information necessary to start the program.

### **Files to be Written**

These data files are written by ***Source Tracker***:

* Databases: The central database, using SQL transactions.
* Text files: Log files are only written to the local disk in cases of network/database failures. Otherwise, system and transaction logs are written to the central database or emailed to users upon request.

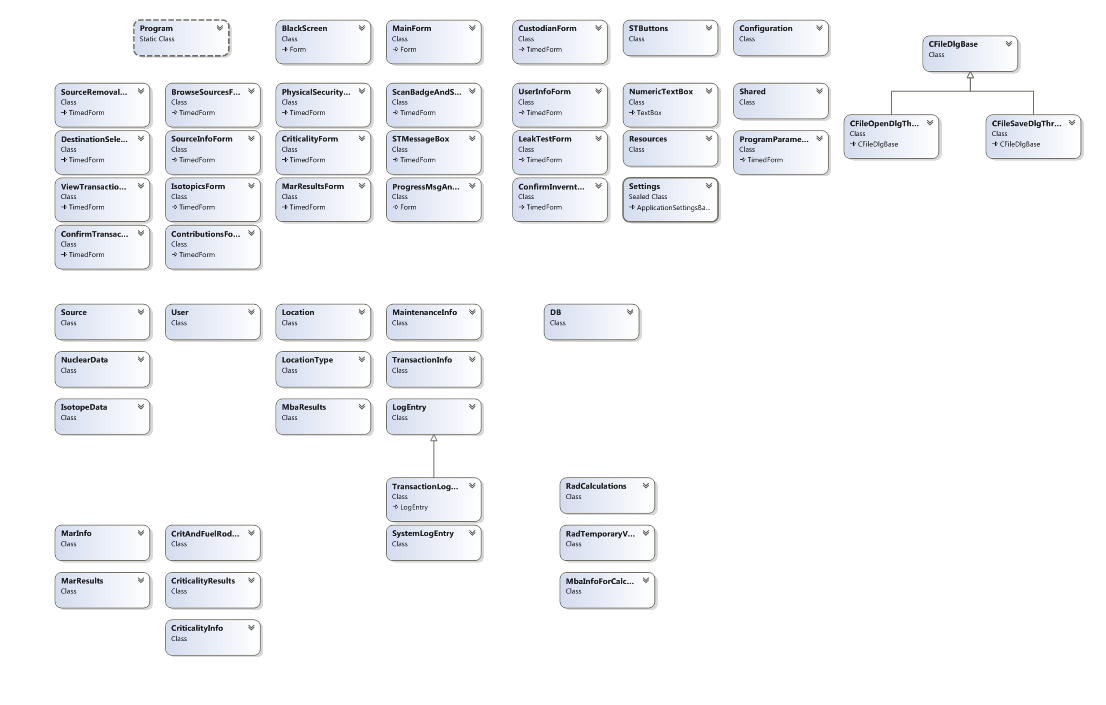
# Modular Design

## .NET Assemblies/Classes

SourceTracker.exe is the single main application program, written in C#. The application uses the window and messaging technology as the basis for interaction with the user and input devices. The modular decomposition falls into the following groups:

1. DB -- general database access and control,
2. UI -- ***Source Tracker*** user interface and presentation, including dialogs, tables, and related user presentation items, and
3. DataStructures – The classes used to store information from database in local memory for manipulation
4. Calculations -- The module used to make MAR, Criticality and Physical Security calculations.
5. Utilities and Common – Classes used for miscellaneous program functions, such as shared configuration classes and extended forms and controls.

Figure 6 Source Tracker Class Diagram



## Processing Narrative

The ***Source Tracker*** software starts automatically when a client system is booted by configuring the Windows Task Scheduler. In the event that the software fails or the machine reboots, the scheduler is set to restart the application at short intervals to assure that the application is always running. The software takes control of the entire touch screen display, hiding the Windows desktop from users. Custodians and Administrators can exit the application by using a function within the Custodian Form.

The ***Source Tracker*** application continuously waits for input events from the touch screen and bar code reader. Based on the contextual state of the application, the software responds to user interaction by performing the context dependent touch screen display steps and database queries.

See the Source Tracker User’s Manual (NEN1-ST-UM).

Perhaps the most notable feature of ***Source Tracker*** is the rule-based transaction processing. Internal rules and conditions apply to operations that impact a source and any safety and hazard calculations. For example, an attempt to move a source to a new location invokes internal checks comparing source attributes such as isotopics, current location, and proposed new location status, against specific hazard and safety limits. These rules for comparison rules are encoded in the software application itself, the data driving the rules is present in both the application and the external database.

## Data Structures

The runtime data structures generally reflect individual tables in the database. See Figure 5 and Appendix A for detailed data structure information.

# Detailed Design

This section presents the detailed design for the ***Source Tracker*** software structure and processing algorithms satisfying the software requirements in *Source Tracker Software Requirements Specification* (NEN1-ST-SRS). Algorithms are described using pseudo-code with sequential, branch and loop statements, and boolean operators. Software structure supporting the algorithm is diagrammed for clarity. For each primary Software Requirement (SR), the related SR section is referenced on the right-hand side of the algorithm statements.

## SR 1 – Verify MAR, Physical Security, Fuel Rod and Criticality Limits

Sources Table;

Nuclear Data Table;

Locations Table

Before & After Values;

OK-or-not message

Source Tracker EXE

Main

Database

User

For each building/MBA

For each Source

If not ANSI certified container OR if checked-out RadCan, Then [SR 1.2]

If Source has a MAR Percentage Override value

Then add it to CAT3 Total Percentage

Else calculate and add CAT3 Contribution Value to the CAT3 Total Percentage

Add Source CAT IV Contribution Value to the CAT IV Total

If source contributes to criticality

Calculate criticality values and add to total

If source is a fuel rod and building has fuel rod limits

Add fuel rod count to total

Show User Before Transfer and After Transfer Values [SR 1.1]

Compare Totals to Limits

If Exceeds Limits [SR 1.3 & 1.4]

Then display “Not OK to Transfer” message

Else display “OK to Transfer” message

When system starts up [SR 1.5]

Tally MAR, Physical Security, Criticality, and Fuel Rod values

Display that MAR, Physical Security and criticality values are being tallied

## SR 2 – Transferring Accountable MASS or RSSDMS Sources

Reminder message

MASS Custodian

MASS-authorized User Z#

Email

MASS-authorized User

Main

Database

New Location

User

Source Tracker EXE

Locations Table;

Sources Table;

Authorized Users Table;

Sources Table  
Transaction Log Table

If Source to transfer is a MASS or RSSDMS Source, Then

User selects new MASS location (to transfer to) for MASS items

OR selects any location for RSSDMS

If transfer is to another MBA, Then

Get and verify MASS-authorized user Z# [SR 2.2]

Remind User to notify MASS Custodian [SR 2.2]

Email MASS Custodian about the transfer

Else if transfer is across a MASS boundary (not to another MBA)

Remind User to notify MASS Custodian [SR 2.3]

Email MASS Custodian about the transfer [SR 2.3]

Else (within MBA and MASS area)

Email MASS Custodian about the transfer [SR 2.1]

## SR 3 – Remove Source From Home Repository

User Z#;

Source (to remove);

New Location;

Continue option

Sources Table;

Authorized Users Table;

Locations Table

Error messages;

Source description & transfer details

Source Tracker EXE

Main

Database

User

Sources Table  
Transaction Log Table

Get & verify User Z#; Get Source (to remove) from User [SR 3.1]

If Source Location is NOT = its Home Repository, Then [SR 3.2]

Display warning message [SR 3.2]

Verify Leak Testing [SR 3.7]

If Transferring a MASS or RSSDMS Source, Then

(do extra stuff, see 4.2) [SR 2]

Get New Location from User

Verify MAR, Physical Security, Fuel Rods and Criticality Limits [SR 1]

Display Source description and transfer details [SR 3.3]

If (exceeds MAR, Physical Security, Fuel Rod or Criticality Limits

Do not allow transaction [SR 1]

Else

Ask User to Complete, Cancel, or Complete-&-Do-More-Transfers? [SR 3.4]

If Complete OR Complete-&-Do-More-Transfers, Then

Update Source location & owner [SR 3.5]

If Complete-&-Do-More-Transfers

Then continue doing more transfers [SR 3.4]

Else (Cancel, so no Database update) [SR 3.6]

## SR 4 – Return Source to Home Repository

Source Tracker EXE

Source (to return)

User

Main

Database

Sources Table;

Locations Table

Error message;

Home Repository Location

Sources Table  
Transaction Log Table

Get Source (to return) from User [SR 4.1]

If source is shown as checked out [SR 4.2]

If Source Location NOT = its Home Repository, Then [SR 4.2]

Display error message & return to main screen [SR 4.3]

Else

Verify MAR, Physical Security, Fuel Rod and Criticality Limits [SR 1]

If (exceeds MAR, Physical Security, Fuel Rod or Criticality Limits

Do not allow transaction [SR 1]

Else

Update Source Location to its Home Repository Location [SR 4.4]

Display completion message

## SR 5 – Re-Assign Source’s Current Location and/or Owner

User Z#;

Source (to re-assign);

New Location;

Continue option

Sources Table;

Authorized Users Table

Main

Database

Source Tracker EXE

User

Sources Table

Source description & transfer details

Get & verify User Z#; Get Source (to re-assign) from User [SR 5.1]

If Transferring a MASS Source or RSSDMS

Then (do extra stuff) [SR 2]

Get New Location from User [SR 5.2]

Verify MAR, Physical Security, Fuel Rods and Criticality Limits [SR 1]

Display Source description and transfer details [SR 5.3]

If (exceeds MAR, Physical Security, Fuel Rod or Criticality Limits

Do not allow transaction [SR 1]

Else

Ask User to Complete, Cancel, or Complete-&-Do-More-Transfers? [SR 5.4]

If Complete OR Complete-&-Do-More-Transfers, Then

Update Source location & owner [SR 5.5]

If Complete-&-Do-More-Transfers

Then continue doing more transfers [SR 5.4]

Else (Cancel, so no Database update) [SR 5.6]

## SR 6 – Transaction Log

Main

Database

Source Tracker EXE

Notification message

Transaction Log Table

Custodian

Source Tracker EXE

Transaction Log Table

Report Request

Main

Database

Custodian

For every transaction performed by a User or a Custodian

Add transaction information into the Transaction Log Table [SR 6.1]

Custodian requests transaction log [SR 6.2]

Logs are retrieved from DB for dates requested [SR 6.2]

If Custodian requests email

Report is emailed to Custodian [SR 6.2]

## SR 7 – Browse Sources

Main

Database

User Z#;

Sort option choice;

Browse search choices

Source Tracker EXE

User

Sources Table;

Authorized Users Table

Source information;

Source details;

Source picture

Get & verify User Z# [SR 7.1]

Get User Sort option choice [SR 7.3]

Get User Browse search choices [SR 7.4 (7.4.1-7.4.5)]

Display Source information (bar code number, source ID, [SR 7.2]

isotope, initial mass, initial and current activities, current owner,

locations, dose rate, MAR, and criticality for each source selected, [SR 7.4, 7.4.5]

sorted by user sort option choice) [SR 7.3]

If User chooses to display source details about a source, [SR 7.5, 7.6]

Then display source details

If User wants to see the sources they currently have checked out, [SR 7.7]

User selects his name as User Z# for source filtering [SR 7.4]

Set current owner to User Z# (selects sources to display)

Display Source information (normal browse display)

## SR 8 – Display Category 3 MAR Status For Each of the Radiation Facilities

Sources Table;

Authorized Users Table;  
Locations Table

Main

Database

Source Tracker EXE

User

User Z#

MAR Percentages per Building

Get & Verify User Z# [SR 8.1]

For each building [SR 8.2]

For each Source

If not ANSI certified container, Then

If Source is a checked-out radiation Canister (RAD Can)

Then Add it to the appropriate CAT3 Building RAD Can Percentage

(If Source has a MAR Percentage Override value then use the MAR

Percentage Override value, else use the CAT3 Contribution Value)

Else add it to the appropriate CAT3 Building Base Percentage

(If Source has a MAR Percentage Override value, then use the MAR

Percentage Override value, else use the CAT3 Contribution Value)

Display the CAT3 Percentages per building (display the RAD Can Percentage,

Base Percentage, and the total of those values), highlighting any that are

over the limit

## SR 9 – Display Category IV Physical Security Status for Each of the MBAs

Sources Table;

Authorized Users Table;

CAT IV Areas Table

Main

Database

Source Tracker EXE

User

User Z#

CAT IV Percentages per MBA

Get & verify User Z# [SR 9.1]

For each MBA [SR 9.2]

For each Source

Add the CAT IV PU Contribution value to the appropriate MBA and attractiveness

level (B, C, D, & E) plutonium sub-total

Add the CAT IV U Contribution value to the appropriate MBA and attractiveness

level (B, C, D, & E) uranium sub-total

Display the CAT IV sub-totals per MBA Area (display by attractiveness levels

and isotope type), highlighting any that are over limits

## SR 10 – Display Criticality and Fuel Rod Status for each of the Radiation Facilities

Sources Table;

Authorized Users Table;

Crit\_Limits Table

Main

Database

Source Tracker EXE

User

User Z#

Criticality values and fuel rod counts per building

Get & verify User Z# [SR 9.1]

For each source

Calculate criticality contributions, if any

Sum criticality values by building

Calculate fuel rod count, if any

Sum fuel rod count by building

Get criticality and fuel rod limits from DB

For each building [SR 9.2]

Populate the table with the building, criticality values, and fuel rod count

Compare with limits and highlight any that exceed limits

## SR 11 -- Sample Source Transaction

Sources Table;

Authorized Users Table;

Nuclear Data Table

Locations Table

User Z#

Main

Database

Source Tracker EXE

User

Get & verify User Z#; Get Source from User [SR 11.1]

Summary of MAR, Physical Security, Fuel Rod Limits for test transaction

Perform Remove, Reassign, Return or Permanently Transfer up to

Results for MAR, physical security, criticality and fuel rod [SR 11.1]

User may only click Cancel, which prevents any database update

## SR 12 -- Confirm Inventory

Custodian Z#;

Source display choice;

Scanned sources

Sources Table;

Authorized Users Table

Main

Database

Source Tracker EXE

Custodian

Summary List Email

Get & verify Custodian Z# [SR 12.1]

Loop until Custodian selects Cancel or Finished

Get Custodian source display choice (all sources, [SR 12.2]

only checked-out sources, or only checked-in sources)

Display list of sources matching the display choice [SR 12.2]

Display running totals (to be confirmed, confirmed, and unexpected) [SR 12.3]

Get scanned source barcode (to confirm inventory) from Custodian [SR 12.4]

Update the source’s last inventory date (to the current date) [SR 12.4]

Verify Leak Testing [SR 12.5 (see SR 17)]

Remove the scanned source from the source list displayed

If source is unexpected, Then

Display expected location [SR 12.6]

Increment (& display) unexpected running total [SR 12.3]

Else

Increment (& display) confirmed running total [SR 12.3]

Decrement (& display) to be confirmed running total [SR 12.3]

End Loop

If sources still in source list (still need to be confirmed), Then

Display warning message & [SR 12.7]

a summarized list of confirmed sources [SR 12.8]

Update System Log with totals

Send summarized list of confirmed sources via email to Custodian [SR 12.8]

(including unexpected sources)

## SR 13 – Transfer a Source Permanently From One Location to Another

Sources Table;

Authorized Users Table;

Locations Table;

Source description & transfer details;

Reminder message

Main

Database

Source Tracker EXE

Custodian

Custodian Z#;

Source (to transfer);

New Location;

Continue option

Sources Table  
Transaction Log

Get & verify Custodian Z# [SR 13.1]

Get scanned source (to transfer) from Custodian [SR 13.2]

Get new permanent location (home repository) from Custodian [SR 13.4]

If a valid permanent location, Then [SR 13.4]

Verify MAR, Physical Security, criticality, and fuel rod Limits [SR 13.3 (see SR 1)]

Display Source description and transfer details [SR 13.5]

If within limits,

Ask Custodian to Complete or Cancel? [SR 13.6]

If Complete, Then

Update Source location [SR 13.7]

Else (Cancel, so no Database update) [SR 13.8]

If source is a MASS source, Then [SR 13.9 (see SR 2)]]

Display message that MASS system must be updated

## SR 14 – Create a Summary csv File of Sources

Custodian

Custodian Z#

Email w/Summary File

Main

Database

Sources Table;

Authorized Users Table

Summary File

Source Tracker EXE

Get & verify Custodian Z# [SR 14.1]

Create Summary File (list of sources) containing all sources - [SR 14.2]

information for each source includes bar code number, source ID, [SR 7.2]

isotope, initial mass, initial and current activities, current owner,

locations, dose rate, MAR, and criticality

If User wants to filter the results, they can be filtered as for Browse Sources [See SR7]

Email Summary File to Custodian & display message that email was sent [SR 14.3/24.3]

## SR 15 – Edit Program Parameters

Get and verify Get & verify Custodian Z# [SR 15.1]

Config File

Database Connection String  
Workstation Location

Leak Test Parameters

Configuration Table

Custodian

Main

Database

Notification that Settings are changed

Source Tracker EXE

Custodian Z#

If (Custodian changes database)

Connect to requested database [SR 15.4]

If (Custodian changes location)

Change location in config file [SR 15.2]

If (Custodian changes leak test parameters)

Store in Configuration table in DB [SR 15.3]

To change main database connection

Modify connection string in .config file [SR 15.5]

## SR 16 -- Record Leak Testing

Custodian Z#;

Source display choice;

Scanned sources

Sources Table;

Authorized Users Table

Source Tracker EXE

Main

Database

Custodian

Update Source Table with new Leak Test Date

Summary List Email

Get & verify Custodian Z# [SR 16.1]

Loop until Custodian selects Cancel or Finished

Get Custodian source display choice (all sources [SR 16.2]

only checked-out sources, or only checked-in sources)

Display list of sources matching the display choice [SR 16.2]

If (Custodian requests Source detail) [SR 16.2]

Show source detail [SR 16.2]

Display running totals (to be leak tested, leak tested, and unexpected) [SR 16.3]

Get scanned source barcode from Custodian [SR 16.4]

If Custodian also wants to confirm inventory, Then [SR 16.5]

Update the source’s last inventory date (to the current date)

Remove the scanned source from the source list if not unexpected

If source is unexpected, Then

Display expected location [SR 16.6]

Increment (& display) unexpected running total [SR 16.3]

Else

Increment (& display) leak tested running total [SR 16.3]

Decrement (& display) to be leak tested running total [SR 16.3]

End Loop

If sources still in source list (still need to be leak tested), Then

Display warning message & [SR 16.7]

a summarized list of leak tested sources [SR 16.8]

Update System Log with totals

Send summarized list of leak tested sources via email to Custodian [SR 16.8]

(including unexpected sources and all sources still needing

leak testing)

## SR 17 – Verify Leak Testing

Sources Table

Warning message

User

Source Tracker EXE

Main

Database

Compare source’s time since last leak test to appropriate leak test

parameter days allowed

If Leak Testing is past due, Then

If extra days parameter (grace period) has already passed, Then

Don’t allow the transfer

Else (grace period has not passed) [SR 17.1]

Display the last leak test date

Display warning message

Allow the transfer

Email Custodian that a source has an expired leak test date

Else

Allow transaction

## SR 18 – Automatic Database Backups

Tivoli Backup Manager

Daily [SR 18.1]

Central Database

Tivoli Storage

Backup central database to Tivoli Storage

If (Backup fails)

Send email [SR 18.2]

## SR 19 -- Manually Input MAR (CAT 3) Contribution Value For a Source

Sources Table  
Authorized\_Users Table

MAR override value

Custodian

Source Tracker EXE

Main

Database

MAR override value to Sources Table

Warning message

Get & verify Custodian Z# [SR 19]

Select Add/Modify Source button and modify the MAR Percentage entry

If (new MAR value OK)

Store MAR override value in database [SR 19]

## SR 20 – Time-out Timers

Custodian

Source Tracker EXE

Main menu

Main menu

User

Timer

If a User or a Custodian begins an operation that displays a screen other than [SR20]

the main menu and does not complete the operation or continue

interacting with the screen within a time limit, Then

Cancel the transaction

Display the previous (parent) screen

## SR 21 – Add/Delete/Modify Source Information

Source Tracker EXE

User Z# scanned  
Source barcode scanned

Main

Database

Authorized\_Users Table  
Sources Table

Custodian

Writes/Updates Sources Table

Email to Custodians  
for verification

Get & verify Custodian Z# [SR 21.1]

Select Add/Modify Source from custodian menu

Get source barcode [SR 21.3]

Allow editing of source information [SR 21.3/21.4]

If user selects Save

If (Source exists in database)

Store source information [SR 21.2]

Else (Source is new)

Store source information and mark ‘unverified’ [SR 24.4]

Email all custodians to notify of new source verification

Else if user selects Cancel

Return to custodian form

Else if user selects Delete

If source has been verified [SR 1]

Write (some) source information to the Removed Sources table

Remove source from the Sources table

SR 22 – Add/ Modify User Information  
  
  
  
  
  
  
  
  
  
  
  
Get & verify Custodian Z# [SR 22.1]

New user warning

Writes/Updates Authorized\_Users Table

User Z# scanned

Custodian

Source Tracker EXE

Authorized\_Users Table

Main

Database

Select Add/Modify User from custodian menu

Allow editing of user information [SR 22.3]

If user selects Save/Update

If (User exists in database)

Store user information [SR 22.2]

Else (Source is new)

Store user information [SR 22.2]

Display warning to check user training

Else if user selects Cancel

If data has been entered then

Ask user if they want to lose the changes

If user answers Yes

Return to custodian form

Else

Return to user information

Else

Return to custodian form

SR 23 – Procedure in Case of Network Outage   
  
  
  
  
  
  
  
  
  
  
  
User requests action needing DB

User Z# scanned or  
source barcode scanned

Main

Database

Source Tracker EXE

User

DB fail warning

Source Tracker unable to connect to central DB [SR 23.1]

Show warning to user [SR 23.1]

Return to Main Screen [SR 23.1]

Until (Database available) [SR 23.1]

Disallow transactions

## SR 24 – Email Notification Requirements

Each night [SR 24.6]

Main

Database

Email results to custodians

Query sources in non-permanent Storage Location

Daily – Stored Procedure

Run stored procedure to query sources not in permanent storage

Email results [SR 24.6]  
  
  
  
  
  
  
  
  
  
  
  
User requests transaction

Main

Database

Source Tracker EXE

User Z# scanned or  
source barcode scanned

Warning -- Unauthorized

Unauthorized User

Email notice to custodians

Authorized\_Users Table

If (User is not an authorized user) [SR 24.5]   
 Show warning  
 Disallow transaction

Send email to custodians

At startup

Main

Database

Source Tracker EXE

Email notice to custodians

Sources Table  
Locations Table

At startup

Do MAR, Physical Security, Fuel Rod and Criticality calculations

Do calculations  
 If (MAR > 80%) [SR 24.2]

Email warning to Custodians

If physical security, criticality, or fuel rod limits are exceeded

Email warning to custodians

User scans MASS source

Main

Database

Source Tracker EXE

MASS/RSSDMS source barcode scanned

Warning – MASS source

Email notice to custodians

Sources Table

User

Warn MASS source requirements [SR 24.1]  
 Email warning to Custodians

User scans RSSDMS source

Email warning to custodians  
  
\*note: Requirements for 24.3 are shown in Section 4.14 and requirements for 24.4 are shown in Section 4.21

## SR 25 – System Security Requirements

User

Requests Shutdown

Custodian

Source Tracker EXE

Windows Scheduler

Verifies that Source Tracker Application is running. Restarts if needed.

At startup and indefinitely every 1 minute [SR 25.1]

Check that Source Tracker is running

If (Not running)

Start Source Tracker

Get & verify Custodian Z# [SR 25.2]

Shut down [SR 25.1]

# Implementation Language

The SourceTracker.exe application is written in C # and compiled with the Microsoft Visual Studio C # VS2013.

# Traceability

Requirements found in (NEN1-ST-SRS) as satisfied by the software design are shown in the design details section above. See also (NEN1-ST-RTM), the Requirements Traceability Matrix.

# Appendix A: Database Table Description

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table Name | Column Name | Data Type | Length | Can be blank |
| Authorized\_Users | znum | int | 4 | 0 |
|  | lname | nvarchar | 100 | 1 |
|  | fname | nvarchar | 100 | 1 |
|  | empgroup | nvarchar | 100 | 1 |
|  | custodian | bit | 1 | 0 |
|  | admin | bit | 1 | 0 |
|  | massauth | bit | 1 | 0 |
|  | phone | nvarchar | 100 | 1 |
|  | email | nvarchar | 100 | 1 |
|  | deactivated | bit | 1 | 0 |
| Configuration | ID | int | 4 | 0 |
|  | MASSInterval | int | 4 | 1 |
|  | NonMASSInterval | int | 4 | 1 |
|  | GracePeriod | int | 4 | 1 |
| Crit\_Limits | locid | int | 4 | 0 |
|  | ta | nvarchar | 100 | 0 |
|  | bldg | nvarchar | 100 | 0 |
|  | pulimit | float | 8 | 1 |
|  | u235limit | float | 8 | 1 |
|  | fuelrodlimit | int | 4 | 1 |
| Locations | Loc\_ID | int | 4 | 0 |
|  | lab | nvarchar | 60 | 0 |
|  | ta | nvarchar | 20 | 1 |
|  | bldg | nvarchar | 20 | 1 |
|  | roomnum | nvarchar | 20 | 1 |
|  | permStorage | bit | 1 | 0 |
|  | storageLocIndex | smallint | 2 | 1 |
|  | oldMASSLoc | smallint | 2 | 1 |
| Locations (cont.) | MASSLoc | nvarchar | 100 | 1 |
|  | MBA | nvarchar | 100 | 1 |
|  | nodename | nvarchar | 40 | 1 |
|  | lastTrans | datetime | 8 | 1 |
|  | currentProgramVers | nvarchar | 100 | 1 |
|  | lastSynch | datetime | 8 | 1 |
| Mar\_Log | ID | int | 4 | 0 |
|  | timestamp | datetime | 8 | 1 |
|  | mar\_fraction | float | 8 | 1 |
|  | bldg | nvarchar | 510 | 1 |
|  | action | nvarchar | 510 | 1 |
|  | barcode | nvarchar | 510 | 1 |
|  | location | nvarchar | 510 | 1 |
|  | destination | nvarchar | 510 | 1 |
| MASS\_Locations | ID | int | 4 | 0 |
|  | MASSLocations | nvarchar | 510 | 1 |
|  | description | nvarchar | 510 | 1 |
| MBA\_Limits | mba\_id | int | 4 | 0 |
|  | U235\_B\_Limit | float | 8 | 1 |
|  | U235\_C\_Limit | float | 8 | 1 |
|  | U235\_D\_Limit | float | 8 | 1 |
|  | U235\_E\_Limit | float | 8 | 1 |
|  | Pu\_B\_Limit | float | 8 | 1 |
|  | Pu\_C\_Limit | float | 8 | 1 |
|  | Pu\_D\_Limit | float | 8 | 1 |
|  | Pu\_E\_Limit | float | 8 | 1 |
|  | MBA\_Num | int | 4 | 1 |
| Nuclear\_Data | NucData\_ID | int | 4 | 0 |
|  | Isotope | nvarchar | 510 | 1 |
|  | SourceType | nvarchar | 510 | 1 |
|  | HalfLife | float | 8 | 1 |
| Nuclear\_Data (cont.) | CiPerGram | float | 8 | 1 |
|  | MARLimit\_Ci | float | 8 | 1 |
|  | RegCiThreshold | float | 8 | 1 |
|  | DosePerCi | float | 8 | 1 |
| Removed\_Sources | ID | int | 4 | 0 |
|  | Barcode | nvarchar | 20 | 0 |
|  | SourceID | nvarchar | 40 | 1 |
|  | Isotope | nvarchar | 100 | 1 |
|  | Enrichment | real | 4 | 1 |
|  | InitMass | real | 4 | 1 |
|  | InitCuries | real | 4 | 1 |
|  | InitActivityDate | datetime | 8 | 1 |
|  | SourceType | nvarchar | 100 | 1 |
|  | Registered | bit | 1 | 0 |
|  | ESH12\_Reg\_Num | nvarchar | 100 | 1 |
|  | StorageLoc | nvarchar | 60 | 1 |
|  | Steward | nvarchar | 100 | 1 |
|  | PhysDesc | nvarchar | 400 | 1 |
|  | MASSItem | bit | 1 | 0 |
|  | RadCan | bit | 1 | 0 |
|  | LastLeakTest | datetime | 8 | 1 |
|  | LastInv | datetime | 8 | 1 |
|  | ExemptSource | bit | 1 | 0 |
|  | Photo\_Cert | varbinary | -1 | 1 |
|  | Photo\_Source | varbinary | -1 | 1 |
|  | LeakTest\_SwipeNum | int | 4 | 1 |
|  | LeakTest\_Comments | nvarchar | 100 | 1 |
|  | DateRemoved | datetime | 8 | 1 |
|  | ReasonRemoved | nvarchar | 400 | 1 |
|  | ManifestNum | nvarchar | 100 | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source\_Types | ID | int | 4 | 0 |
|  | SourceType | nvarchar | 100 | 1 |
| Sources | ID | int | 4 | 0 |
|  | BarCode | nvarchar | 20 | 0 |
|  | SourceID | nvarchar | 40 | 1 |
|  | Isotope | nvarchar | 100 | 1 |
|  | Enrichment | real | 4 | 1 |
|  | InitMass | real | 4 | 1 |
|  | InitCuries | real | 4 | 1 |
|  | InitActivityDate | datetime | 8 | 1 |
|  | Mar\_Perc\_Override | real | 4 | 1 |
|  | DoseRate | real | 4 | 1 |
|  | Registered | int | 4 | 1 |
|  | ESH12\_Reg\_Num | nvarchar | 100 | 1 |
|  | StorageLoc | nvarchar | 60 | 1 |
|  | CurrLoc | nvarchar | 60 | 1 |
|  | Curr\_Owner\_Znum | int | 4 | 1 |
|  | DateStamp | datetime | 8 | 1 |
|  | Steward | nvarchar | 100 | 1 |
|  | PhysDesc | nvarchar | 400 | 1 |
|  | MASSItem | bit | 1 | 0 |
|  | RadCan | bit | 1 | 0 |
|  | LastLeakTest | datetime | 8 | 1 |
|  | LastInv | datetime | 8 | 1 |
|  | ExemptSource | bit | 1 | 0 |
|  | Photo\_Cert | varbinary | -1 | 1 |
|  | Photo\_Source | varbinary | -1 | 1 |
|  | PhotoTitle | nvarchar | 100 | 1 |
|  | LeakTest\_SwipeNum | int | 4 | 1 |
|  | LeakTest\_Comments | nvarchar | 100 | 1 |
|  | Pu\_Attr\_Level | nvarchar | 100 | 1 |
| Sources (cont.) | Pu\_Contr | float | 8 | 1 |
|  | U\_Attr\_Level | nvarchar | 100 | 1 |
|  | U\_Contr | float | 8 | 1 |
|  | Pu238\_Perc | real | 4 | 1 |
|  | Pu239\_Perc | real | 4 | 1 |
|  | Pu240\_Perc | real | 4 | 1 |
|  | Pu241\_Perc | real | 4 | 1 |
|  | Pu242\_Perc | real | 4 | 1 |
|  | Am241\_Perc | real | 4 | 1 |
|  | Verified | bit | 1 | 0 |
|  | FuelRod | int | 4 | 1 |
|  | EnteredBy | int | 4 | 1 |
|  | VerifiedBy | int | 4 | 1 |
| System\_Log | SysLogID | int | 4 | 0 |
|  | timestamp | datetime | 8 | 1 |
|  | location | nvarchar | 100 | 1 |
|  | succeeded | bit | 1 | 0 |
|  | comment | nvarchar | 500 | 1 |
| Transaction\_Log | TransLog\_id | int | 4 | 0 |
|  | lname | nvarchar | 30 | 1 |
|  | fname | nvarchar | 30 | 1 |
|  | znum | int | 4 | 1 |
|  | timestamp | datetime | 8 | 1 |
|  | destination | nvarchar | 100 | 1 |
|  | barcode | nvarchar | 20 | 1 |
|  | sourceid | nvarchar | 40 | 1 |
|  | isotope | nvarchar | 50 | 1 |
|  | masstransfer | bit | 1 | 0 |
|  | action | nvarchar | 100 | 1 |
|  | location | nvarchar | 60 | 1 |
|  | failed | bit | 1 | 0 |