Welcome

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T313:
Applying Your Test Plan to Environmental Sensor Stations (ESS) Based on NTCIP 1204 v04 ESS Standard
Instructor

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President
Trevilon LLC
Magnolia, TX, USA
Learning Objectives

Describe the **role of test plans** and the testing to be undertaken

Identify **key elements** of NTCIP 1204 v04 relevant to the test plan

Describe the **application** of a good test plan to an ESS system being procured

Describe the **testing** of an ESS using standard procedures
Describe the role of test plans and the testing to be undertaken
What Is an Environmental Sensor Station (ESS)?

**ESS Capabilities**

- May remotely monitor:
  - Wind speed and direction
  - Temperature, humidity, and pressure
  - Precipitation type and rate
  - Snow accumulation
  - Visibility
  - Pavement conditions
  - Radiation
  - Water level
  - Air quality

- Can also support:
  - Snapshot cameras
  - Pavement treatment systems

- “Station” may be mobile

Source: Intelligent Devices, Inc.
Testing and the System Lifecycle

Testing to be Undertaken
Why We Test

To Confirm That the System Will Work as Intended

Traceability

User Needs

System Requirements

System Verification & Validation
Why We Test

To Confirm That the System Will Work as Intended

Testing can **objectively ensure** that a system is:
- **Validated**: Solves the right problem
  - Satisfies the user needs
- **Verified**: Solves the problem right (correctly)
  - Satisfies the system requirements as designed

NTCIP standardizes user needs and requirements

NTCIP Testing **verifies**
- **Compliance**: Supports selected needs and requirements
- **Conformance**: Implements per standardized design
Testing is a general Information Technology need

Topic of IEEE 829-2008

IEE Standard for Software and System Test Documentation
A Test Plan answers the key questions
Who Is Responsible for Testing Tasks?

Different people may:
- Provide items to be tested
- Provide the test facility
- Set up the test environment
- Perform and report on the test

Each requires unique skills and resources

NTCIP Testing may be performed by:
- Agency: May not know NTCIP details
- Vendor: Conflict of interest issues
- 3rd Party: May be difficult to access
Different test plans will typically be used to test:

- Software modules
- Components
- The system as a whole

NTCIP Testing generally tests one component

NTCIP 1204 testing generally tests either:

- The ESS (the controller and connected sensors), or
- The manager that communicates with the ESS
Different test plans may be used to test:
- Communications
- Functionality
- Performance
- Hardware
- Environmental

NTCIP Testing: testing of communication interface

Test Plan should identify what else will be tested
- Will sensor values be compared against actual conditions?
- Will communication response times be measured?
- Will communications be tested with power outages?
ESS Test Plan

When Will It Be Tested?

Right side of the V-diagram

Each stage may have one or more test plans

NTCIP testing
- Typically during subsystem verification
- May be included in other stages
ESS Test Plan

Where Will It Be Tested?

Need to describe the test environment:
- **Bench**: limited sensor data
- **Laboratory**: simulated data (price?)
- **Real-world**: real data
  - Difficult to test limits
  - Safety implications?

**Location of tester**
- **Local** testing: Lower response times
- **Remote** testing: Lower costs?

**NTCIP 1204 testing may use any**
- **Trade-offs** should be considered
Why Is It Being Tested?

Verify conformance

Verify compliance (project-specific?)

Other practical reasons
  ▪ Requirement for acceptance
    ▫ Pay item
    ▫ Approval to move to next phase of project
  ▪ Troubleshooting
ESS Test Plan

How Will It Be Tested?

Test plan describes **tools** required

NTCIP testing uses **test software**
- Performs role of **one component**
- Often **automates** portion of step-by-step procedures
- May be supplemented by data analyzer

Source: NTCIP 8007
NTCIP Test Plan is a Level Test Plan

Often multiple Level Test Plans in a project

Master Test Plan defines how various Levels fit together
  - Purpose of each level test plan
  - Order in which they are performed
Test Design / Test Case / Test Procedure

Test Design
- Maps features to be tested to test cases
- Makes any refinements to test approach

Test Cases
- Specifies
  - Inputs
  - Outputs
  - Refinements

Test Procedures
- Step-by-step instructions

Standardized in Annex C of NTCIP 1204 v04
- Reduces effort to customize

Customized in your test plan
- Specify which requirements will be tested
ACTIVITY
Which of the following most accurately describes a benefit of having standardized NTCIP test documentation included in NTCIP 1204 v04?

Answer Choices

a) Eliminates the need for customized test documentation
b) Reduces the effort to customize test documentation
c) Ensures that all devices conform to the standard
d) Eliminates the need for additional tools to perform testing
Review of Answers

a) Eliminates the need for customized test documentation

Incorrect. Test plans are still needed to customize testing to each specific project.

b) Reduces the effort to customize test documentation

Correct! Most of the documentation has been standardized.

c) Ensures that all devices conform to the standard

Incorrect. Each device still needs to be tested to verify conformance.

d) Eliminates the need for additional tools to perform testing

Incorrect. Testing will still rely on tools to communicate with the device under test.
Learning Objectives

Describe the role of test plans and the testing to be undertaken

Identify key elements of NTCIP 1204 v04 relevant to the test plan
Learning Objective 2

Identify key elements of NTCIP 1204 v04 relevant to the test plan
Relationship Among NTCIP Standards

Source: NTCIP Guide
Structure of NTCIP 1204 v04

NTCIP 1204 v04 Outline (Body)

1. General
2. Concept of Operations
3. Functional Requirements
4. Dialogs
5. Management Information Base
Structure of NTCIP 1204 v04

NTCIP 1204 v04 Outline (Annexes)

A. Requirements Traceability Matrix
B. Object Tree
C. Test Procedures
D. Documentation of Revisions
E. User Requests
F. Generic Clauses
G. SNMP Interface
H. Controller Configuration Objects
Elements Related to Testing

NTCIP 1204 v04 Outline

User Needs, PRL Requirements

Design

RTM

1. General
2. Concept of Operations
3. Functional Requirements
4. Dialogs
5. Management Information Base
   A. Requirements Traceability Matrix
   B. Object Tree

Test Design, Cases, Procedures

C. Test Procedures
D. Documentation of Revisions
E. User Requests
F. Generic Clauses
G. SNMP Interface
H. Controller Configuration Objects
Elements Related to Testing

Test Plan

Specific for each project

Outline defined by IEEE 829-2008

- Example in Student Supplement

Features to be tested based on PRL

- Section 2 of NTCIP 1204 v04
**Elements Related to Testing**

### PRL (Section 2)

<table>
<thead>
<tr>
<th>User Need ID</th>
<th>User Need</th>
<th>CR ID</th>
<th>Functional Requirement</th>
<th>Conformance</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.2.1.1</td>
<td>Monitor Atmospheric Pressure</td>
<td></td>
<td></td>
<td>Yes / No/ NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5.2.1.10.1</td>
<td>Retrieve Atmospheric Pressure Metadata - Location</td>
<td>Yes</td>
<td>No / NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5.2.1.10.2</td>
<td>Retrieve Atmospheric Pressure Metadata - Sensor Information</td>
<td>Yes</td>
<td>No / NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5.2.1.10.3</td>
<td>Configure Atmospheric Pressure Metadata - Location</td>
<td>Yes / No / NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5.2.3.2.10</td>
<td>Retrieve Atmospheric Pressure</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.6.1</td>
<td>Required Number of Atmospheric Pressure Sensors</td>
<td>Yes</td>
<td>NA</td>
</tr>
</tbody>
</table>

- **Agency completes the PRL for each project**
  - Identifies the specific requirements that must be supported
  - All selected requirements should be tested at some point
Elements Related to Testing

Test Design Specification (Annex C)

- Format conforms to NTCIP 8007 (See Module T202)
- Standard traces requirements to test cases
- If requirement is selected in PRL, each traced test case should be performed
- Project test plan should reference the table and note any exceptions taken

<table>
<thead>
<tr>
<th>Requirement</th>
<th>ID</th>
<th>Title</th>
<th>Test Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5.2.1.6 Configure Pavement Sensor</td>
<td></td>
<td></td>
<td>C.2.3.2.6 Configure Pavement Sensor</td>
</tr>
<tr>
<td>3.5.2.1.7 Configure Subsurface Sensor - Text Description</td>
<td></td>
<td></td>
<td>C.2.3.2.7 Configure Subsurface Sensor</td>
</tr>
<tr>
<td>3.5.2.1.8 Configure Passive Ice Detection Logic</td>
<td></td>
<td></td>
<td>C.2.3.2.8 Configure Passive Ice Detection Logic</td>
</tr>
</tbody>
</table>
Elements Related to Testing

Test Case Specification (Annex C)

<table>
<thead>
<tr>
<th>Test Case: 3.4</th>
<th>Title: Retrieve Air Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>This test case verifies that the ESS allows a management station to determine the current temperature from a temperature sensor.</td>
</tr>
<tr>
<td>Variables:</td>
<td>Required_Temperature_Sensors PRL 3.6.3</td>
</tr>
<tr>
<td>Pass/Fail Criteria:</td>
<td>The device under test (DUT) shall pass every verification step included within the Test Case to pass the Test Case.</td>
</tr>
</tbody>
</table>

Standard defines each test case with inputs and outputs

Project NTCIP Test Plan should:
- Reference these definitions
- Identify the input values that will be used for the tests
  - E.g., How many temperature sensors are required?
Elements Related to Testing

Test Procedures (Annex C)

- Standard defines test procedures for each test case and indicates the requirements tested at specific points
- Project NTCIP Test Plan should reference the procedures
Test preparation documentation is defined by properly linking

- Project-specific test plan to...
- NTCIP 1204 v04
Which statement most closely describes the documentation that a project should prepare before conducting NTCIP 1204 v04 testing?

**Answer Choices**

a) Just reference Annex C of NTCIP 1204 v04

b) Develop a test plan with appropriate additions to link to NTCIP 1204 v04

c) Develop a test plan and set of test procedures with appropriate additions to link to NTCIP 1204 v04

d) Develop all documents defined by IEEE 829-2008
Review of Answers

a) Just reference Annex C of NTCIP 1204 v04

*Incorrect. Annex C does not define project-specific details such as when, what, who, where, how, and why.*

b) Develop a test plan with links to NTCIP 1204 v04

*Correct! Most of the documentation is done; you just customize to your project with a test plan with some links.*

c) Develop a test plan and set of test procedures with links

*Incorrect. The test design specification is already defined in the Requirements to Test Case Traceability Matrix.*

d) Develop all documents defined by IEEE 829-2008

*Incorrect. Most of this documentation has been standardized.*
Learning Objectives

Describe the **role of test plans** and the testing to be undertaken

Identify **key elements** of NTCIP 1204 v04 relevant to the test plan

Describe the **application** of a good test plan to an ESS system being procured
Learning Objective 3

Describe the application of a good test plan to an ESS system being procured
Typical ESS

- NTCIP 1204 v04 has mandatory and optional user needs
- A typical ESS might include:
  - Wind sensor
  - Temperature sensor
  - Humidity sensor
  - Air pressure sensor
  - Precipitation sensor
  - Multiple pavement sensors
  - Multiple subsurface sensors
  - Camera
Other Modules That Assist in Defining Requirements

Sample PRL Selections for Site

<table>
<thead>
<tr>
<th>2.5.2.1.2</th>
<th>Monitor Winds</th>
<th>O.5 (1..*)</th>
<th>Yes</th>
<th>No / NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5.2.1.2</td>
<td>(Wind)</td>
<td>O</td>
<td>Yes</td>
<td>No / NA</td>
</tr>
<tr>
<td>3.5.2.1.11.1</td>
<td>(WindLoc)</td>
<td>O</td>
<td>Yes</td>
<td>No / NA</td>
</tr>
<tr>
<td>3.5.2.1.11.2</td>
<td>Retrieve Metadata for Each Wind Sensor - Text Description</td>
<td>O</td>
<td>Yes</td>
<td>No / NA</td>
</tr>
<tr>
<td>3.5.2.1.11.3</td>
<td>Configure Wind Sensor Metadata - Location</td>
<td>Wind:O; WindLoc:O</td>
<td>Yes</td>
<td>No / NA</td>
</tr>
<tr>
<td>3.5.2.3.2.2</td>
<td>Retrieve Wind Data</td>
<td>M</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>3.6.2</td>
<td>Required Number of Wind Sensors</td>
<td>M</td>
<td>Yes</td>
<td>NA</td>
</tr>
</tbody>
</table>

Each user need has **optional** and **mandatory** requirements

PRL allows user to **select** standardized requirements from list using standardized rules

Modules A313a and A313b provide more information on PRL

Student Supplement contains a complete PRL
Requirements to Test Case Traceability Table

- Contained in NTCIP 1204 v04 Annex C Clause C.2.2
- Identifies test cases for each requirement
Understanding Test Case Traceability

Test Case Specification

<table>
<thead>
<tr>
<th>Test Case: 3.3</th>
<th>Title: Retrieve Wind Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>This test case verifies that the ESS allows a management station to determine current wind information.</td>
</tr>
<tr>
<td>Variables:</td>
<td>Required_Wind_Sensors</td>
</tr>
<tr>
<td>Pass/Fail Criteria:</td>
<td>The device under test (DUT) shall pass every verification step included within the Test Case to pass the Test Case.</td>
</tr>
</tbody>
</table>

Clause C.2.3.3.3 of NTCIP 1204 v04

- Defines the test case with inputs (variables) and outputs (criteria)
- In order to perform the test, we need to know the number of sensors
  - Sample PRL for Requirement 3.6.2 defines this to be 1
- Test procedures are shown immediately under this description
Create a Test Plan for ESS

Contents of an NTCIP Test Plan

Complete draft test plan in Student Supplement

- Why
  - Test Plan Identifier
  - Scope
- What
  - Items to be tested
  - Features to be tested
  - Features not to be tested
  - Approach
  - Item Pass/Fail Criteria
- How
  - Suspension Criteria
  - Test Deliverables
  - Testing Tasks
- Where
  - Environment/Infrastructure
- Who
  - Responsibilities and Authority
  - Staffing and Training Needs
- When
  - Schedule, Estimates and Cost
  - Risk and Contingencies
  - Glossary
Create a Test Plan for ESS

Why

Objectives
- What is the primary purpose of the test
- What happens upon successful completion

Project Background
- Allows reader to understand the context of the test

Scope
- Explain that this will be an NTCIP test

References
Create a Test Plan for ESS

What

Items to be tested
- Identify the device that will be tested

Features to be tested
- Identify the requirements that will be tested

Features not to be tested
- Explain the limitations of the testing
Create a Test Plan for ESS

How

Approach
- Define inputs (variables)
- What happens if there is a failure (regression)

Item Pass/Fail Criteria (Outputs)
- Identify what constitutes a failure

Suspension Criteria
- Identify restrictions on stopping and starting tests

Test Deliverables
- What deliverables will be produced

Testing Tasks
- What tasks need to be done

Procedures defined separately
Where

Environment/Infrastructure

- How will equipment be connected
  - Remote, local, combination

- Other needs
  - Tables
  - Chairs
  - Protection from elements
  - Power
Create a Test Plan for ESS

Who

Identify who is responsible for what

Identify level of effort needed
Create a Test Plan for ESS

When

Schedule

How is schedule impacted if things go wrong
Which of the below is not included in a test plan?

Answer Choices

a) Identification of who will perform the testing
b) Identification of which features will be tested
c) Identification of the reason for the test
d) Identification of the steps used to test the device
Review of Answers

a) Identification of who will perform the testing

Incorrect. The test plan should identify who is responsible for testing.

b) Identification of which features will be tested

Incorrect. The test plan should identify which features will be tested.

c) Identification of the reason for the test

Incorrect. The test plan should identify the reason the test is being planned.

d) Identification of the steps used to test the device

Correct! The test procedures are defined in a separate document.
Describe the **role of test plans** and the testing to be undertaken.

Identify **key elements** of NTCIP 1204 v04 relevant to the test plan.

Describe the **application** of a good test plan to an ESS system being procured.

Describe the **testing** of an ESS using standard procedures.
Describe the testing of an ESS using standard procedures
What is “wind information”?
3.5.2.3.2.2 Retrieve Wind Data

Upon request, the ESS shall return the following information for each wind sensor reporting to the ESS:

a) The average wind speed recorded during the 2 minutes preceding the observation in tenths of meters per second;

b) The average direction the wind is blowing from, as recorded during the 2 minutes preceding the observation, measured clockwise in degrees from true north;

c) The current wind speed in tenths of meters per second;

d) The current direction the wind is blowing from, measured clockwise in degrees from true north;

e) The maximum wind gust recorded during the 10 minutes preceding the observation in tenths of meters per second;

f) The direction of the maximum wind gust recorded during the 10 minutes preceding the observation, measured in degrees clockwise from true north; and

g) The assessment of the wind situation from a staffed station as defined by the Beaufort Wind Scale in the Glossary of Meteorology. Valid values are: other, unknown, calm, light breeze, moderate breeze, strong breeze, gale, moderate gale, strong gale, storm winds, hurricane force winds, and gusty winds.
Overview

Procedures are defined in Annex C of standard

- Saves agencies from having to develop their own
- Allows for off-the-shelf automation of testing

Sample is “Test Case C.2.3.3.3 Retrieve Wind Data” used in the previous example
## Explain a Sample Test Procedure

### Retrieve Wind Data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **1** | **CONFIGURE:** Determine the number of wind sensors required by the specification (PRL 3.6.2). **RECORD** this information as:  
   » Required_Wind_Sensors |
| **2** | **GET** the following object(s):  
   » windSensorTableNumSensors.0 |
| **3** | **VERIFY** that the **RESPONSE VALUE** for windSensorTableNumSensors.0 is greater than or equal to Required_Wind_Sensors. |
| **4** | Determine the **RESPONSE VALUE** for windSensorTableNumSensors.0. **RECORD** this information as:  
   » Supported_Wind_Sensors |
| **5** | **FOR EACH** value, N, from 1 to Supported_Wind_Sensors, perform Steps 5.1 through 5.22. |
| **5.1** | **GET** the following object(s):  
   » windSensorAvgSpeed.N  
   » windSensorAvgDirection.N  
   » windSensorSpotSpeed.N  
   » windSensorSpotDirection.N  
   » windSensorGustSpeed.N  
   » windSensorGustDirection.N  
   » windSensorSituation.N | **Pass / Fail**  
(Sec. 3.5.2.3.2.2)
### Explain a Sample Test Procedure

#### Retrieve Wind Data

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CONFIGURE: Determine the number of wind sensors required by the specification (PRL 3.6.2). RECORD this information as: Required_Wind_Sensors</td>
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<td>FOR EACH value, N, from 1 to Supported_Wind_Sensors, perform Steps 5.1 through 5.22.</td>
</tr>
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</table>

Pass / Fail (Sec. 3.5.2.3.2.2)
## Explain a Sample Test Procedure

### Retrieve Wind Data

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>CONFIGURE</strong>: Determine the number of wind sensors required by the specification (PRL 3.6.2). RECORD this information as: Required_Wind_Sensors</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>GET</strong> the following object(s): windSensorTableNumSensors.0</td>
<td>Pass/Fail (Sec. 3.5.2.3.2.2)</td>
</tr>
<tr>
<td>3</td>
<td><strong>VERIFY</strong> that the RESPONSE VALUE for windSensorTableNumSensors.0 is greater than or equal to Required_Wind_Sensors.</td>
<td>Pass/Fail (Sec. 3.6.2)</td>
</tr>
<tr>
<td>4</td>
<td>Determine the RESPONSE VALUE for windSensorTableNumSensors.0. RECORD this information as: Supported_Wind_Sensors</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>FOR EACH</strong> value, N, from 1 to Supported_Wind_Sensors, perform Steps 5.1 through 5.22.</td>
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# Explain a Sample Test Procedure

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| 5.1 | **GET** the following object(s):  
  » windSensorAvgSpeed.N  
  » windSensorAvgDirection.N  
  » windSensorSpotSpeed.N  
  » windSensorSpotDirection.N  
  » windSensorGustSpeed.N  
  » windSensorGustDirection.N  
  » windSensorSituation.N |

*Pass / Fail (Sec. 3.5.2.3.2.2)*
## Explain a Sample Test Procedure

### Retrieve Wind Data

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<td>GET the following object(s): windSensorTableNumSensors.0</td>
<td>Pass / Fail (Sec. 3.5.2.3.2.2)</td>
</tr>
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<td>VERIFY that the RESPONSE VALUE for windSensorTableNumSensors.0 is greater than or equal to Required_Wind_Sensors.</td>
<td>Pass / Fail (Sec. 3.6.2)</td>
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<td>Determine the RESPONSE VALUE for windSensorTableNumSensors.0. RECORD this information as: Supported_Wind_Sensors</td>
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<td>Pass / Fail (Sec. 3.5.2.3.2.2)</td>
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<td>3</td>
<td>VERIFY that the RESPONSE VALUE for windSensorTableNumSensors.0 is greater than or equal to Required_Wind_Sensors.</td>
<td>Pass / Fail (Sec. 3.6.2)</td>
</tr>
<tr>
<td>4</td>
<td>Determine the RESPONSE VALUE for windSensorTableNumSensors.0. RECORD this information as: Supported_Wind_Sensors</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>FOR EACH value, N, from 1 to Supported_Wind_Sensors, perform Steps 5.1 through 5.22.</td>
<td></td>
</tr>
</tbody>
</table>
### Explain a Sample Test Procedure

#### Retrieve Wind Data

<table>
<thead>
<tr>
<th>Step</th>
<th>Verify Condition</th>
<th>Pass/Fail</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>RESPONSE VALUE for windSensorAvgSpeed.N is greater than or equal to 0.</td>
<td>Pass/Fail (Sec. 5.6.10.4)</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>RESPONSE VALUE for windSensorAvgSpeed.N is less than or equal to 65535.</td>
<td>Pass/Fail (Sec. 5.6.10.4)</td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>RESPONSE VALUE for windSensorAvgSpeed.N is appropriate.</td>
<td>Pass/Fail (Sec. 5.6.10.4)</td>
<td></td>
</tr>
</tbody>
</table>

Some VERIFY steps can be easily **automated**

Others require **human interaction**
Other Types of Test Steps

Other Step Types in NTCIP 1204 v04

**DELAY** *<for a period of time>*

**PERFORM** *<another test procedure>*

**SET** *<one or more objects to defined values>*

**IF** *<condition>* **ELSE** *<false branch>*
Analyze and Record Test Results

Reported Failures

Errors can be from a number of sources

- Errors in the implementation
- **User** Errors:
  - Incorrectly **configured** inputs at start of test
  - Incorrectly **evaluating** a test step
- **Equipment** malfunction
- Errors in the **procedure**
- Errors in the **standard**

Maturity of standards reduce the risks in last two areas

Once an error is identified

- Investigate and if valid, report the issue
Automation Is Essential

Automation can dramatically accelerate the testing process

Reduces probability of errors in testing
  ▪ A new source of potential error
  ▪ But reduces potential for user error
  ▪ Correct once and reuse

Some steps still require manual verification
Which of the below is not a type of step used in NTCIP 1204 v04 testing?

**Answer Choices**

a) UPDATE  
b) SET  
c) VERIFY  
d) IF
a) UPDATE

Correct! There is no definition for “UPDATE” in NTCIP 1204 v04 testing.

b) SET

Incorrect. A SET request can be used to alter the value of a parameter in the ESS.

c) VERIFY

Incorrect. A VERIFY step can be used to ensure that the device is responding properly.

d) IF

Incorrect. An IF step can be used to branch the procedure logic based on the evaluation of a condition.
Module Summary

Describe the **role of test plans** and the testing to be undertaken.

Identify **key elements** of NTCIP 1204 v04 relevant to the test plan.

Describe the **application** of a good test plan to an ESS system being procured.

Describe the **testing** of an ESS using standard procedures.
We Have Now Completed the ESS Curriculum

Module 11: A313a: Understanding User Needs for ESS Systems Based on NTCIP 1204 v04 Standard

Module 15: A313b: Specifying Requirements for ESS Systems Based on NTCIP 1204 v04 Standard

Module 18: T313: Applying Your Test Plan to ESS Based on NTCIP 1204 v04 ESS Standard
Thank you for completing this module.

Feedback
Please use the Feedback link below to provide us with your thoughts and comments about the value of the training.

Thank you!