

A photograph of an industrial facility, likely a refinery or chemical plant, at night. The scene is illuminated by various lights, creating a complex pattern of highlights and shadows. Several tall, cylindrical distillation columns are visible, some with ladders and platforms. A large, striped smokestack is prominent on the left. The background is a dark blue sky, and the foreground shows more industrial structures and piping.

**Mangan Inc.**

**SI Data Imports  
LTUF August 2023  
Nezar Faitouri**

# Mangan (Control System and Automation Company)

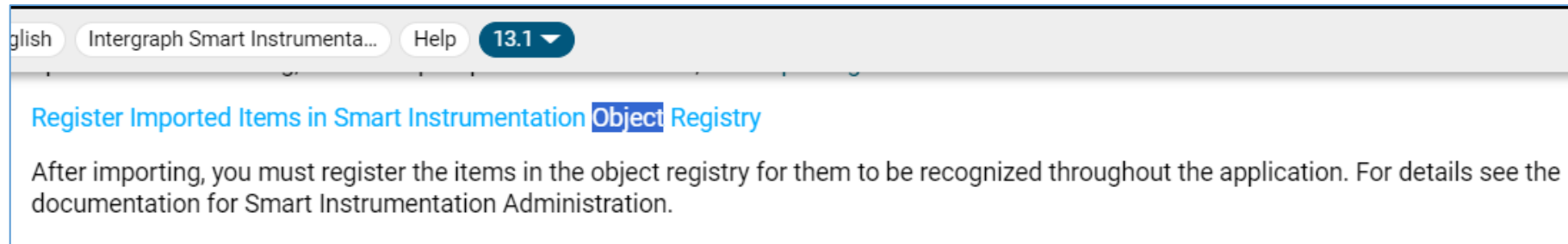


# Smart Instrumentation (INtools/SPI/SI) Services

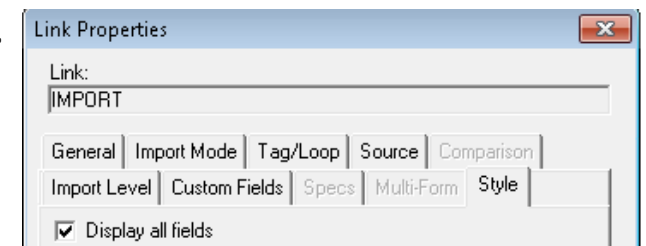
- Consulting and Administration.
- Upgrades.
- Training.
- Data Migrations.
- As-Built.
- Data Assessment.
- Interfaces.
- Customization.
- Control System Projects .
- Data Audits “Engineering, Design, and Database”.
- Hosting.
- We always say, Mangan provides Smart Instrumentation services from A to Y (Z coding of the software “Hexagon”).

# Smart Instrumentation Data Imports

- The data imported into SI is heavily dependent on the source file and the data quality.
- Where applicable, we must honor the SI data requirements and not the user data requirements
- The preferred source files for data imports remain as Microsoft Excel and Microsoft Access.
- The import utility should behave exactly like manual implementation (tables and fields).
- Notes:
  - After any data imports, user must execute register items (administration module) for the imported items to be registered appropriately in the object\_registry table.



- Fields may not be set/triggered by the import utility; therefore, they will need to be set in the import link (Ex: merge\_release\_flg).
- Where applicable, always check the box for All Fields in your import property link.
- As a reference, see import presentation published here [Slide 1 \(spi-ltuf.org\)](http://slide1(spi-ltuf.org)).



# Examples (Data Quality and Data Requirements)

- **Supporting Tables:**
  - SI Selection is Flow (Process Function) – FT (Instrument Type Name) – DP Flow Transmitter (Instrument Type Description).
  - Import Source File shows Flow (Process Function) – FT (Instrument Type Name) – D/P Flow Transmitter (Instrument Type Description).
  - Result: 2 selections in SI after import because of DP vs. D/P.
  - Requirement: Must match SI supporting table selection.
- **Unit of Measures and Flags:**
  - SI Selection (UOM Code) is GPM and the flag is @ Standard.
  - Import Source File shows US gal/min and the flag is @ STD.
  - Result: US gal/min @ STD; however, SI cannot recognize such selection.
  - Requirement: Must match SI where UOM field is GPM and UOM flag field is S.
- **Specification Data Drop Down List (DDDL):**
  - The spec\_udf field is designed as a DDDL in the PSR file.
  - The SI spec selection is Data Display as Loop Powered and the Data Value as 1.
  - Import source file shows Loop Powered.
  - Result: Loop Powered; however, SI cannot recognize this appropriately.
  - Requirement: Must match the SI spec Data Value.
  - Note: It is always recommended when dealing with DDDL to have the Data Value match the Data Display.
- **Remember: EDE only displays valid and appropriate data.**

# Examples (Data Quality and Data Requirements)

- Tag Signal (wire\_group table):
  - The panel\_name is the panel where the tag signal originated from (Ex: Device Panel).
  - The strip\_name is the strip where the tag signal originated from (Ex: Device Panel strip).
  - \*\* The channel\_name is the I/O channel that the tag signal is associated with. \*\*
    - If the channel\_name is not mapped, some of the default wiring reports will not display the channel data. However, some tag signals may not require an I/O channel association such as Elements connected to Transmitters.
    - If the channel\_name is mapped, the import utility does not update with the correct channel\_id in the wire\_group table.
  - The solution to appropriately update the channel\_id in the wire\_group table is by SQL statement (get the channel\_id from the control\_system\_tag table assuming I/O association is complete).
- Other Fields to hard code in import links:
  - Merge\_release\_flg: While it is said this field is no longer in use (SI V2018 and above).
    - When Null, the SI item cannot be modified (Item not scoped to the project).
    - Hard code to 'N' for new items.
  - Generated\_flg: This is a field in the loop table. The field is either Y or N.
    - When not defined and depending on import link properties, loops are rejected.
    - Hard code to 'N' for new loops.

# Examples (Data Quality and Data Requirements)

- Notes (Spec, process Data, etc):

- Importing notes is tricky especially with the line break.
- In the source file, break your notes into multiple columns.

G	H	I	J
Note 1	Note 2	Note 3	Note 4
1. Note 1	2. Note 2	3. This is a test	4. Etc.

- In the import link, use the +#+ when mapping the notes fields. The # sign is the line break. The + sign is the concatenation.

Source IMPORT				Target SPEC_SHEET_DATA Definition: Default			
Name	Type	Length		Source Name	Target Name	Type	Length
note_1	char	255			REV NO/REV ID	char	20
note_2	char	255			SPEC FORM CNUM/SPEC FORM I	char	20
note_3	char	255					
note_4	char	255					
				note_1 +#+ note_2 +#+ note_3 +#+ note_4	SPEC NOTE	intext	16
					SPEC SECTION NAME/SPEC SEC	char	50

- Source File Header Name:

- Always ensure the source file header name do not have any spaces or special characters. Use underscore \_ when required.
- The import utility will not recognize the source file when header names has spaces or special characters, and software will crash.

## Q&A

Your questions please.

The following slides are from a previous presentation  
“OPTIMIZING THE SMARTPLANT INSTRUMENTATION  
V2009 IMPORT MODULE”

# 2011 Presentation

## **OPTIMIZING THE SMARTPLANT INSTRUMENTATION V2009 IMPORT MODULE**

Nezar Faitouri, Mangan Technical Consultant



# Introduction

- The SPI import utility provides a faster way to implement SPI data (loops, tags, specs, etc) from external source files such as Microsoft Excel.
- The purpose of this presentation is to give the SPI user a small/starting guideline document for the SPI Import utility, tips and tricks, issues, etc.
- This presentation is not intended to be a training document and can't be used by first time SPI import users.
- It is strongly recommended for first time import users:
  - To attend the SPI import classes provided by Intergraph
  - To seek consulting services regarding the SPI import utility.
- It is strongly recommended to have a SPI database backup before importing.
- It is strongly recommended that only SPI users that understands SPI tables to perform SPI imports, just in case for unexpected issues and troubleshooting purposes.

# SPI Import Source Files

- Source Files
  - There are several types of source files:
    - Microsoft Excel, Microsoft Access, and CSV.
    - Text.
    - Dbase.
    - Note: All source files for SPI import utility must be in a flat file format (header and data).

	A	B	C	D	E	F	G
1	Tag_Number	Service	Loop_Name	Loop_Service	Line_Number	Instrument_Type	Process_Function
2	101-ALARM-001	PLC Cabinet Gene	101-A -001	PLC Cabinet Gene		ALARM	General
3	101-FE -100	Feed from V-8	101-F -100	Feed from V-8	4"-P-1501-11H	FE	Flow
4	101-FE -102	Feed from C-1	101-F -102	Feed from C-1	4"-P-1502-11H	FE	Flow
5	101-FE -201	Stripping Steam to	101-F -201	Stripping Steam to	1.5"-S-2001-4C	FE	Flow
6	101-FE -2212	Feed to B-101 Pas	101-F -2212	Feed to B-101 Pas	3"-FO-1212-4C	FE	Flow
7	101-FE -2213	Feed to B-101 Pas	101-F -2213	Feed to B-101 Pas	3"-FO-1213-4C	FE	Flow
8	101-FE -2214	Feed to B-101 Pas	101-F -2214	Feed to B-101 Pas	3"-FO-1212-4C	FE	Flow
9	101-FE -9000	TEST	101-F -9000	TEST		FE	Flow
10	101-FE -9001		101-F -9001	DCS closed loop		FE	Flow
11	101-FE -9002		101-F -9002	DCS closed loop		FE	Flow

## SPI Import Source Files

- SPI Import Utility and Microsoft Excel
  - In my experience, the most successful source file for SPI imports is Microsoft Excel
    - Easy data manipulation and clean up.
    - Easy data validation.
    - Using the ASAP utility, it makes it a very powerful tool for batch editing and validation of data.
    - Using macros and functions.
  - In your source file, it is strongly recommended to always:
    - Cleanup the UOM's, flags, and codes to match SPI database requirements such as "US gal/min vs. GPM".
    - For the UOM's, match the SPI UOM code names (SPI – Tools – Unit of Measures and Codes). If customized, then match the customization.
    - Cleanup the loop and tag naming conventions to match SPI naming convention structure.
    - Cleanup the supporting table information to match SPI database requirements such as instrument types, I/O types, wire colors, etc.

# SPI Import Source Files

- It was reported by some SPI users that sometimes, the Excel file data does not import successfully. This is because the Excel file data format must be Text format (highlight data – right click – format – text); however, even doing this does not work 100%. To eliminate the issue, do the following:
  - In the excel source file, add a second row with the letter “a” across your data fields.

	A	B	C	D	E	F	G
1	Tag Number	inst type	Service	Process Function Type	IO Type Name	Status	Location
2	a	a	a	a	a	a	a
3	999-FE -100	FE	Feed from V-8	Flow	N/A	N	Field
4	999-FE -102	FE	Feed from C-1	Flow	N/A	N	Field

- Save the file. Open Microsoft Access and import the Excel file into access. The “a” row ensures that all data imported to access is in a text format. Double check this by opening the imported table in the design view mode.
- Export the file to Microsoft Excel format. The file name used will be the Excel file name range that the SPI import utility uses. It is strongly recommended that the name ranges are always UNIQUE.
- If the same name range is used twice for 2 different excel files (none unique name range), the first Excel file is linked to the SPI import utility successfully; however, the SPI import utility will map the first file again even if you pointed to the second file.
- Now, the file is ready to be used with the SPI import utility. **Remember** to Delete the “a” row from the source file before importing.

# General Import Optimization

- SPI Fields to map:
  - Merge\_Release\_flg: This is the owner Operator database flag that is used with the admin option to keep a view only copy of a project after a Merge. Always in any import link, if the field is available, set this flag to 'N'. If not set, project records will not merge into As-built.

Source Name	Target Name	Type	Length
'N'	MERGE RELEASE FLG	char	1

- Def\_flg: This is the wiring flag that separates the project and reference wiring data. If project wiring data, set the flag to 'N'. If reference wiring data, set the flag to 'Y'.

Source Name	Target Name	Type	Length
'N'	DEF FLG	char	1

Source Name	Target Name	Type	Length
'Y'	DEF FLG	char	1

- Process Data Cases: This field applies to process data tables (pd\_general, flow, analyzer, etc) and spec sheet tables (spec\_sheet\_data, add\_spec1, etc). It is the primary key for these tables along with the tag number.
  - If the data imported does not include case data, the default mapping for Oracle and Watcom is “

Source Name	Target Name	Type	Length
"	CASE NAME/CASE ID	char	200

# General Import Optimization

- If the data imported does not include case data, the default mapping for MS-SQL will be as follows:
  - The MS-SQL default case name is \*; however, the import utility does not recognize the \* if mapped as '\*'.
  - The workaround is to update the \* (update process\_condition set case\_name = 'XXX' where case\_id = 0). The XXX could be anything, the XXX is just an example.
  - In the import link, set the case name to 'XXX'.

Source Name	Target Name	Type	Length
'XXX'	CASE NAME/CASE ID	char	200

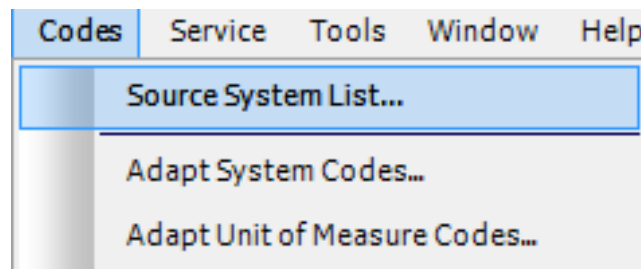
- Once the import is complete, update the default case name to the original value (update process\_condition set case\_name = '\*' where case\_id = 0).
- If the imported data do have case information, then the case name must be part of the excel source file.
  - SPI V2009 SP2 and lower, the cases must be enabled in SPI first to import the data; otherwise, the data will be rejected.
  - For V2009 SP3, the cases do not need to be enabled in SPI first as the import can import the cases as new records.

# General Import Optimization

- SPI Import Link Table Definitions
  - It is never recommended to modify the import Table Definition on your own. Always, contact Intergraph for help. These are the primary, foreign keys, and table relation. If modified without Intergraph help, the risk is very high in corrupting the database.
  - There are several table definitions that Intergraph developed that can be used such as Line Process Data table import, Wiring imports especially for Wiring Equipments, Channels, Strips, etc.



- SPI Import System Source Codes
  - The system source code provides the capability of mapping source file data that does not match SPI codes. Ex: US gal/min vs. GPM.



# General Import Optimization

- The System code can be used and applied to UOM's and Other SPI codes.
- Basically, the idea here is not to clean the excel source file to match the SPI requirements, instead, the user uses the source system function to translate the source file data to SPI UOM's and codes.
- In order for this function to work, the user must check the box to Use system Codes under the link property window.
- **Personally**, I do not recommend using this function as we experienced issues with it in the past such as some of the ones defined do not show up in the import link even if the check box is checked to use it. As usual, always clean the source file.

Codes:

UOM Code	Unit of Measure	Source UOM Code
US gal	US gallon	
US gal/d	U.S. gallon/day	
US gal/h	U.S. gallon/hr	
US gal/min	U.S. gallon/min.	GPM
US gal/s	U.S. gallon/sec.	
US kbbbl/d	U.S. kilobarrel/day	
US kbbbl/h	U.S. kilobarrel/hour	

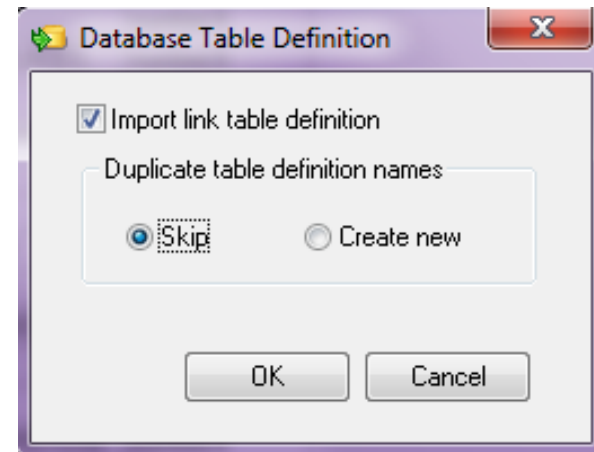
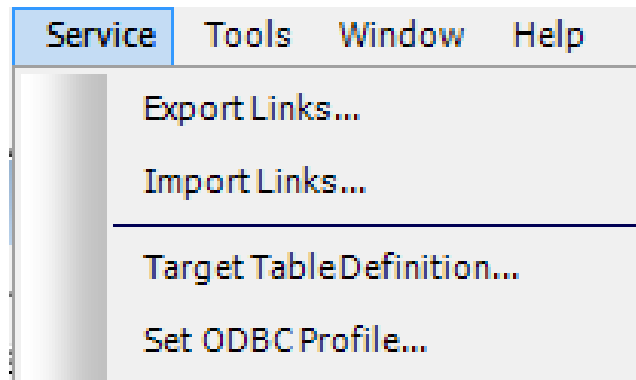
Codes:

Target	Target description	Source code
1	PLAIN CARBON STEEL (SAE 1045)	
10	INCONEL X, ANNEALED	
11	HAYNES STELLITE 25 (L605)	
12	COPPER (ASTM B152, B124, B153)	

☐ Use system codes

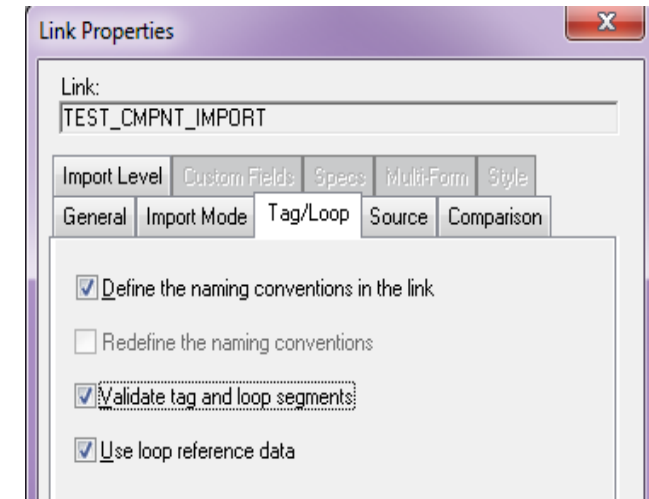
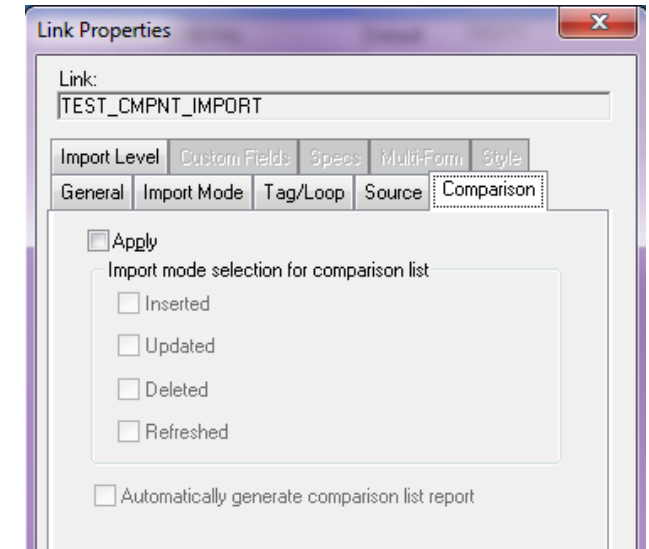
# General Import Optimization

- SPI Import links from another SPI database
  - It is possible to import links from other SPI databases as long as the SPI versions are matching. If the versions are not matching, there is a possibility it will work; however, it may not work due to table changes, etc.
  - When importing links, it is always recommended to Create a New Duplicate table definition names just in case that the default table definitions were modified in the source database.



# General Import Optimization

- SPI Import Comparison Option
  - The comparison option can only be used with table imports.
    - It is extremely helpful especially when comparing supporting tables such as the instrument types table. It will list inserted, updated, deleted, and refreshed (no change).
  
- SPI Import Tag/Loop Definition
  - Always Define the naming convention in the link. This means loop and tags will be cleaned in the source file.
  - Always recommended to check the validate tag and loop segment. If unchecked, the import will not validate consistency Between tag instrument type and the table, and Loop measured variable and the table.



# Optimizing Instrument Index Import

- Excel Source File
    - Recommended as minimum data:
      - Tag Number, Instrument Type, Instrument Type Desc., Process Function, and Tag Category ID.
      - If importing to multiple units, then include the Plant Name, Area Name, and Unit Name or Unit No.
      - If the Tag Number has a loop, then include the Loop Name and the Loop Measure Variable.
      - If the Tag Category ID is not included, all tags will be imported as Conventional Tags.
      - Always recommended to match between the tag instrument type and its table, and loop measured variable and its table.
- Ex: Tag: 101-FE-1000; therefore, instrument type in source file is FE.

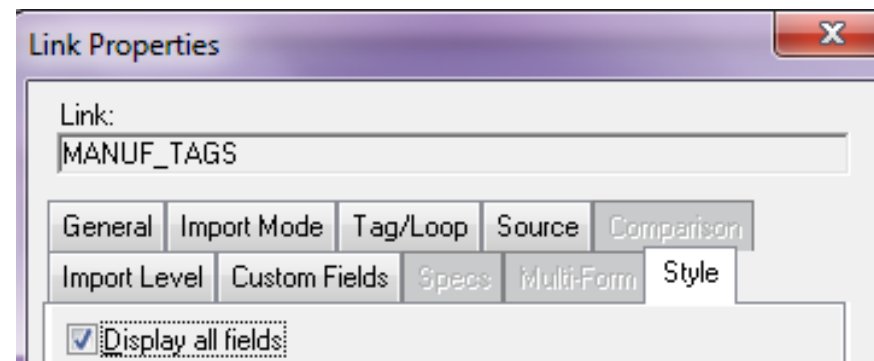
Tag Category Id	Tag Category Name
0	Conventional
1	Telecom
2	Foundation Fieldbus
3	Typical
5	Electrical Signal Tag
6	Analyzer Component
7	Analyzer Stream
8	Functional requirement
9	Foundation/Profibus PA virtual tag
10	Profibus DP
11	Profibus PA
12	HART Device
13	HART Signal
14	Soft Tag
15	Test Equipment

## Optimizing Instrument Index Import

- If the loop service and tag service are provided in the source file; therefore, a column in the source file called Apply Service must be added. The data will be:
  - Y if the loop service description will match the tag service description.
  - N if the loop service description does not match the tag service description.
- The same applies to loop equipment and loop P&ID vs. tag equipment and tag P&ID. Two additional columns called Apply Equipment and Apply P&ID. The mapping will be to the loop section of the import.
- If this is not set, the default when importing new loops is Y to all three fields; therefore, the loop service, loop P&ID, and loop equipment will overwrite the tag info regardless of the source file data.
- Never have a model number without a manufacturer name. The SPI import utility allows imports models without manufacturers 😞

# Optimizing Instrument Index Import

- Import Utility
  - Link Properties
    - Either use the Instrument Index Module Import or the Table imports.
    - If tables imports are used, several links must be created for the different imported data (instrument types, instrument location, P&ID, Equipment, loop, component, etc). Always remember the SPI table hierarchy when create the table import order. Ex: Import P&ID's first and then loops and tags.
    - If the module import is used, several links must be created; however, not as much as table imports. Ex: Instrument Certification is not part of the module import; therefore, a table import needs to be done for the instrument certification, and then the index module import.
    - For an index module import, always check the box for display all fields. This will show additional SPI fields to map to.



# Optimizing Instrument Index Import

- Always leave the creation of complimentary data unchecked. There are several issues reported and experiences in previous SPI versions. Always generate this data from within SPI once the import is complete.
- Always activate the Import Level if importing to multiple units.
- In addition, you can import to multiple As-Built projects if needed.

The screenshot shows the 'Import Level' tab selected among others like 'Custom Fields', 'Specs', 'Multi-Form', and 'Style'. It contains the following settings:

- Hierarchy levels:** A checkbox labeled 'Apply' is checked.
- Data import level:** A dropdown menu is set to 'Plant'.
- Import unit data using:** Two radio buttons are present; 'Unit number' is selected, and 'Unit name' is unselected.
- Specify target projects in link:** An unchecked checkbox at the bottom.

The screenshot shows a dialog box titled 'Create complementary elements'. It contains a table with two columns: 'Element' and 'Create'.

Element	Create
Device Panel	<input type="checkbox"/>
Specification	<input type="checkbox"/>

Arrows on the right side of the table indicate it can be scrolled.

# Optimizing Instrument Index Import

- Hidden codes/flags and issues
  - In previous versions, there are several codes and flags that were reports to cause issues if not mapped, some of them are resolved in the new versions, and some are fixed once the import is executed. These codes and flags should only apply to new loops and tags imported. These codes and flags are:

SPI Field	Table Name	Value	Issue of not set
Loop Sheet Type Flag	Loop	1	Loop revision comparison will not work
Type Gen	Loop	Z	Loops will not show in the domain explorer (loop folder)

- There are other flags that caused issues in previous versions; however, they are fixed in V2009 by the import itself

## Optimizing Process Data Import

- Excel Source File
  - Recommended as minimum data:
    - Tag Number, fluid state (pd\_fluid\_phase), and case name.
    - I added the SPI field name (pd\_fluid\_phase) because the fluid state and fluid phase SPI fields are swapped. The fluid phase SPI field is pd\_fluid\_state.
    - Remember, if all tags do not have the process data cases activated, then use the options motioned in the section of SPI Field mapping for process data cases.
    - If importing to multiple units, then include the Plant Name, Area Name, and Unit Name or Unit No.
    - If the tag instrument type is different than the instrument type table, the import will reject the records. Always recommended to have the tag instrument type and its table matching.

# Optimizing Process Data Import

- Import Utility
  - Link Properties
    - Either use the process data Modules Import or the Table imports (pd\_general, flow, temperature, etc).
    - Always create the process data sheet to create the SPI drawing/report record for manual or imported revision.
    - Fluid State flags are:

Fluid State	Flag
Liquid	L
Gas/Vapor	G
Steam	S
Water	W
Solid/Powder	P
N/A or Other	O

Create complementary elements

Element	Create
Pd Sheet	<input checked="" type="checkbox"/>

## Optimizing Process Data Import

- Hidden codes/flags and issues
  - There is only one (pd\_line\_eq\_flg). L means tag is assigned to Line in process data module, and E means tag is assigned to Equipment in the process data module. If not set, the line size information will not show in the process data report.
  - Remember, it is always recommended to have the UOM codes, and flags cleaned in the source file.

## Optimizing Specification Data Import

- Excel Source File
  - Recommended as minimum data:
    - Tag Number, spec form number (if table import), and case name.
    - Remember, if all tags do not have the process data cases activated, then use the options motioned in the section of SPI Field mapping for process data cases.
    - If importing to multiple units, then include the Plant Name, Area Name, and Unit Name or Unit No.
    - If the tag instrument type is different than the instrument type table, the import will reject the records. Always recommended to have the tag instrument type and its table matching.
    - If importing by spec forms and specs are not normalized, always split the source files by the forms for easy data cleanup and mapping.
    - Always match the spec form drop down list codes and not the full data description.

# Optimizing Specification Data Import

- Import Utility
  - Link Properties
    - Either use the Specification Modules Import (by form) or the Table imports (spec\_sheet\_data, add\_spec1, etc).
    - Always create the process data sheet to create the SPI drawing/report record for manual or imported revision.
- Hidden codes/flags and issues
  - None.

Create complementary elements

Element	Create
Drawing & Revision	<input checked="" type="checkbox"/>

# Optimizing Wiring Data Import

- Excel Source File
  - All wiring items must have a unique name for a successful import (panels, strips within the same panel, racks within the same panels, slots within the same rack, and wiring equipments within the same panel or the same racks, or the same slots, cables, and cable sets within the same cable).
  - The import does not use the sequence as the uniqueness, it uses the item name. Only terminals and wires imports uses the sequence.
  - The source file needed and the order of the wiring import for conventional wiring is as follows:
    - Supporting tables (panel manufacture, model, terminal types, cable colors, etc).
    - Panel table – cabinet\_rack (racks) table – rack\_position table (slots) – apparatus (wiring equipments) – panel\_strip (strips) – channel – panel\_strip\_term (terminals).
    - Cable table – cable\_set table (pairs, triads, etc) – wire table.
    - Panel\_component table (this is to link the tags to the device panels).
    - Control\_system\_tag (this is to link and import tags with the CS tags).
    - General\_signal (this is to link and import general signals to tags).
    - Wire\_group (this is to link the tags with the signals).
    - Wire\_terminal (this is to create the wiring connections).

## Optimizing Wiring Data Import

- Make sure that the item sequence numbers are unique (strips within a panel, rack within the panel, slots within a rack, etc). If not, the import will rejected the records where sequence is not unique.
- Make sure to include the apparatus category name to the wiring equipment source file (I/O Card, I/O Termination, Relay, etc). In addition, the source files must be split depending on the wiring equipment import structure (panel – rack – slot – wiring equipment) or (panel – rack – wiring equipment) or (panel – wiring equipment), etc.
- Make sure to split the channel source file depending on the channel import structure (panel – strip – channel) or (panel – strip – channel), etc.
- Make sure to split the strip source file depending on the strip import structure (panel – strip) or (panel – wiring equipment – strip), etc. In addition, when importing I/O strips, make sure to provide the I/O type of the I/O strip.
- The source file split is done because the primary key's will be different from one import to another. Example: if importing an I/O strip, the wiring equipment name must be included in the source file (panel – wiring equipment – strip).; however, if the source file included non I/O strips and the wiring equipment name is blank, the import will reject the records with blank wiring equipment names.
- This is why, there are several target table definitions that are defined by Intergraph to use for such imports.

# Optimizing Wiring Data Import

- Flags to include in the source files:

Panel Type	Panel Category ID	Panel Sub Category ID	Panel Category Seq
DCS	5	510	2
PLC	6	610	1
Cabinet	3	310	4
Conv. Device Panel	4	410	3
Junction Box	1	110	6
Marshaling Panel	2	210	5
Safety System	5	520	2

Channel Type	Channel Category Value
I/O Channel	I
Apparatus Channel	H
Multi-Input Device or Regular Channel	G

# Optimizing Wiring Data Import

- Flags to include in the source files:

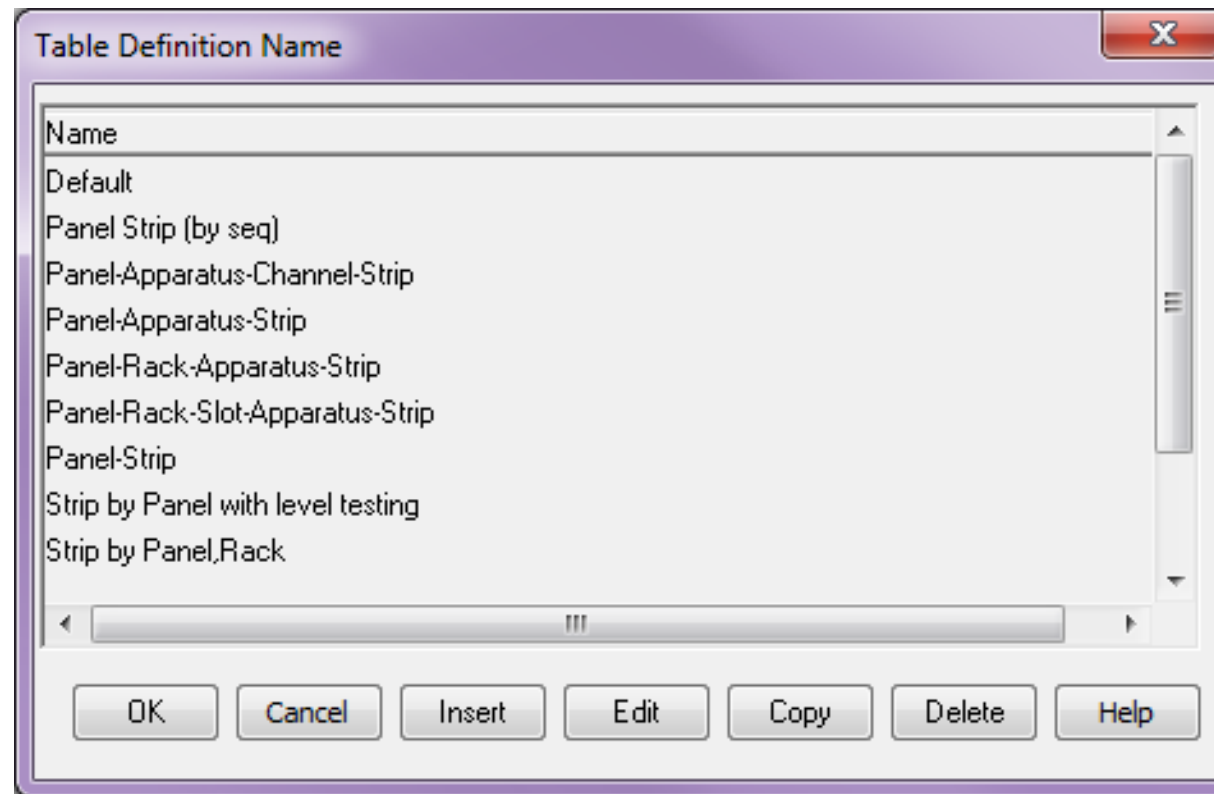
Strip Type	Strip Category Value
Regular Strip and Conv. I/O Strip	0
Apparatus (Conv. and Fieldbus)	8
Fieldbus I/O Strip	1

Terminal Type	Terminal Configuration Value
Regular	G
Right	R
Left	L
Right/Left	H

Cable Type	Cable Category Value
Conventional	R
Telecom	T
Foundation Fieldbus	H

# Optimizing Wiring Data Import

- Import Utility
  - Table/Target Definitions
    - Example of the panel\_strip target/table definition table import



## I/O Assignment Import

- SPI I/O Assignment
  - When performing a SPI I/O assignment manually, SPI populates the control\_system\_tag table and the wire\_group table. The control\_system\_tag table to create the I/O assignment and the wire\_group table to create the tag signal.
- Import I/O Assignment
  - Unfortunately, when running an import for the I/O assignment, (control\_system\_tag), the import utility does NOT create the necessary records in the wire\_group table; therefore, another import must be executed to update the wire\_group table.
    - Control\_system\_tag table import minimum fields are (cs tag name, tag name, panel name, strip name, and channel number).
    - Wire\_group table import minimum fields are (group\_name, tag name, panel name, strip name, channel number, and wire\_group\_category\_id). The group name = tag name.
    - Wire\_group\_category\_id = 0 for instrument tags.