

SmartPlant 3D Electrical Reference Data

Student Workbook

Process, Power & Marine



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Preface

This document is designed as an aid for students attending the SmartPlant 3D Electrical Reference Data presented by Intergraph Corporation, and it's a supplement to the standard product documentation.

Objective

This document is designed to provide comprehensive information of what is in SmartPlant 3D Electrical Reference Data version 2007

Course description

Upon completing this course, you will be able to:

Provide an overview of the SmartPlant 3D Electrical Reference Data. It describes general information about the catalog schema, terms, and the electrical reference data.

Course Reference Material

- SmartPlant 3D Reference Data Guide
- SmartPlant 3D Symbols Reference Data Guide
- Electrical Reference Data Guide

Questions or suggestions relating to this document should be directed to:
SmartPlant 3D Training Services

Lab 1: Cable tray Specification

Objective

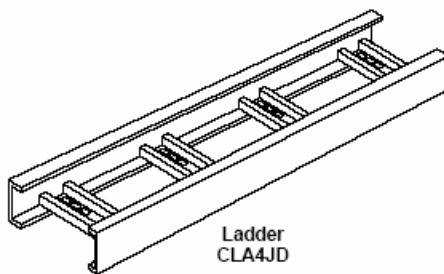
After completing this lab, you will be able to:

- Create a cable tray specification

Note: This lab is intended as a basic introduction to spec creation. As such it is limited to cable tray straight, 30 deg, 45 deg and 90 deg Horizontal elbows and other common fittings. It is not intended as an example of a functional design spec.

Create a cable tray specification with the following data
See specification provided by Square D ladder

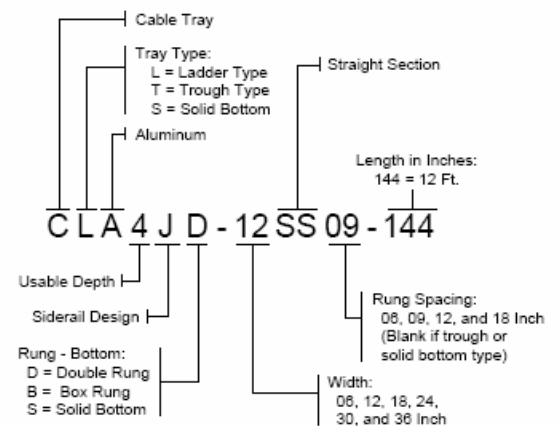
4 in (102 mm) Load Depth – Aluminum – NEMA Type Class 12B



SQUARE D
GROUPE SCHNEIDER

Product Features

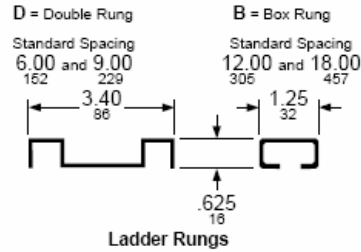
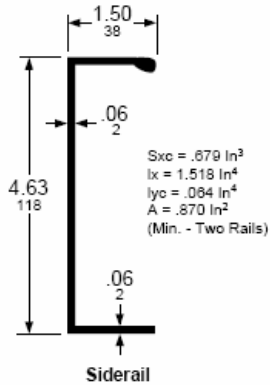
- Rugged welded construction.
- Space saving design (siderail flanges turned in).
- Rounded siderail flanges protect cables.
- All designs permit easy cable dropout with no sharp edges to damage insulation.
- Slotted rung and bottom allows simple cable fastening.
- Supports a 200 lb concentrated load (static load applied to middle six inches with no permanent deformation).
- High strength splices allow random locations between supports (full sections used on all simple beams).
- Aluminum is alloy 6063-T6 special 30,000 PSI minimum yield strength.
- Also available – Epoxy Painted or PVC Coated.
- Pair of splices included with each tray section.
- Standard straight section length is 12 ft (3.7 m).
- Complete line of fittings and accessories.



Load Chart

Support Span	FT	m	FT	m	FT	m	FT	m
	6.00	1.8	8.00	2.4	10.00	3.0	12.00	3.7
Load – Lbs/Ft	340		191		122		85	
Deflection	IN	mm	IN	mm	IN	mm	IN	mm
	0.33	8	0.58	13	0.90	23	1.31	33

Deflection shown is for simple beam. Under installed conditions (2 spans or greater) the deflection is between ¼ and ½ of simple beam values. Lesser loads on same span yield proportionally less deflection. E.g., 42 lbs/ft on a 12 ft span would yield 0.65 in deflection.



Editing Cabletray Spec

Spec Name	SD-CLA4JD-12-12B
Rung Spacing	6"
NEMA	12B
Material	Aluminum
DefaultBendRadius	12 inches
Traylength	144 inches
PreferredGap	0.375 inches

1. Open the CabletraySpec worksheet.
2. Add the following data in the columns noted for the new cabletray specification.

Head	SpecName	Manufacturer	Material	TrayType	RungSpacing	LoadSpanClassification	Description	Is TraySpecification	DefaultBendRadius	PreferredGap	TrayLength
Start											
a	SD-CLA4JD-12-12B	698	5	5	6in	25	Square D, Aluminum, 6" Ladder, NEMA 12B	TRUE	12in	0.375in	144in

Creating Cable Tray Straight Records

Straight Length

Type: Ladder

Length: 12 ft

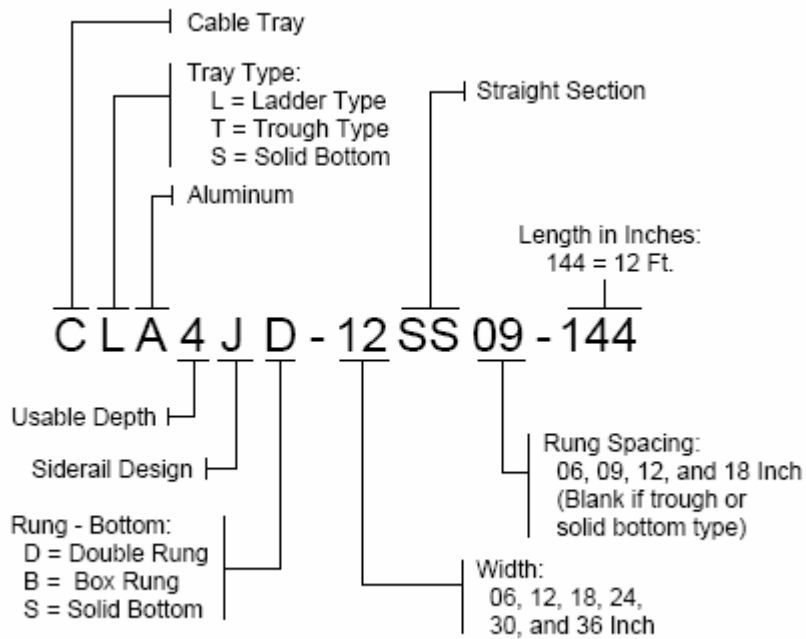
Run Spacing: 6 “

Material: Aluminum

Size Rail Height: 4.63”

Width sizes: 06” and 12”

STRAIGHT PART NUMBER



1. Open the Straight worksheet.
2. Add records for cable tray straight as shown below:

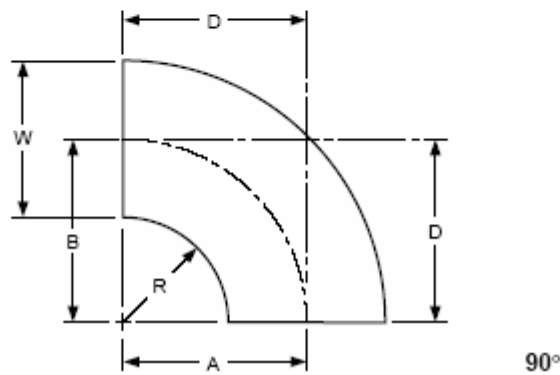
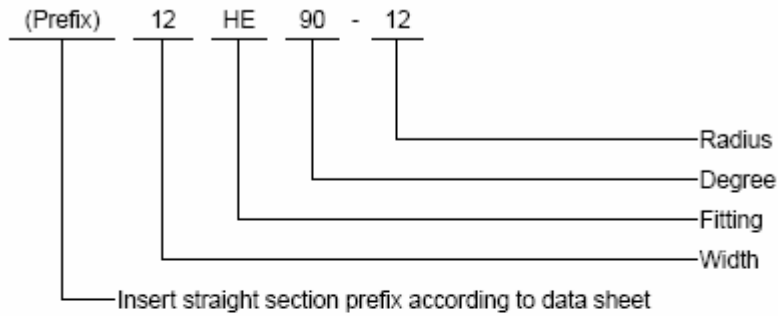
PartNumber	PartDescription
CLA4JD-06-SS06-144	Straight, 4" Load Depth - Aluminum, Ladder, 6" Rung, 6" W x 4" D x 144" L
CLA4JD-12-SS06-144	Straight, 4" Load Depth - Aluminum, Ladder, 6" Rung, 12" W x 4" D x 144" L

Common Key Inputs					Component Specific Inputs							
Manufacturer	Material	TrayType	ComponentType	LoadSpanClassification	RungSpacing	Length	BendAngle	BendRadius	TangentLength	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	5	25 6in	144in					5		
698	5	5	5	25 6in	144in					5		

			Port Data											
NominalWidth	NominalDepth	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in		6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in		12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

Creating Cable Tray 90 Deg Horizontal Elbow Records

Catalog Numbering System



Bend Radius (R)		Width (W)		90 Degree Horizontal Bend		Outline Dimensions					
						A		B		D	
IN	mm	IN	mm	Catalog Number		IN	mm	IN	mm	IN	mm
12	305	6	152	Prefix	-06HE90-12	15.00	381	15.00	381	15.00	381
		12	305		-12HE90-12	18.00	457	18.00	457	18.00	457
		18	457		-18HE90-12	21.00	533	21.00	533	21.00	533
		24	610		-24HE90-12	24.00	610	24.00	610	24.00	610
		30	762		-30HE90-12	27.00	686	27.00	686	27.00	686
		36	914		-36HE90-12	30.00	762	30.00	762	30.00	762
24	610	6	152	Prefix	-06HE90-24	27.00	686	27.00	686	27.00	686
		12	305		-12HE90-24	30.00	762	30.00	762	30.00	762
		18	457		-18HE90-24	33.00	838	33.00	838	33.00	838
		24	610		-24HE90-24	36.00	914	36.00	914	36.00	914
		30	762		-30HE90-24	39.00	991	39.00	991	39.00	991
		36	914		-36HE90-24	42.00	1067	42.00	1067	42.00	1067
36	762	6	152	Prefix	-06HE90-36	39.00	991	39.00	991	39.00	991
		12	305		-12HE90-36	42.00	1067	42.00	1067	42.00	1067
		18	457		-18HE90-36	45.00	1143	45.00	1143	45.00	1143
		24	610		-24HE90-36	48.00	1219	48.00	1219	48.00	1219
		30	762		-30HE90-36	51.00	1295	51.00	1295	51.00	1295
		36	914		-36HE90-36	54.00	1372	54.00	1372	54.00	1372

1. Open the CT90HBend worksheet.
2. Add records for 90 Deg Horizontal Elbow as shown below:

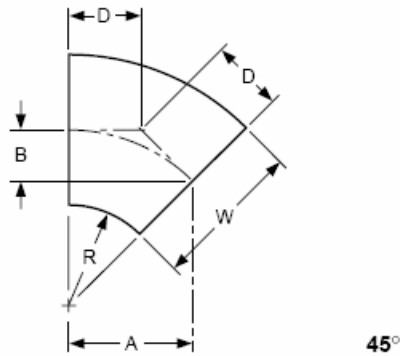
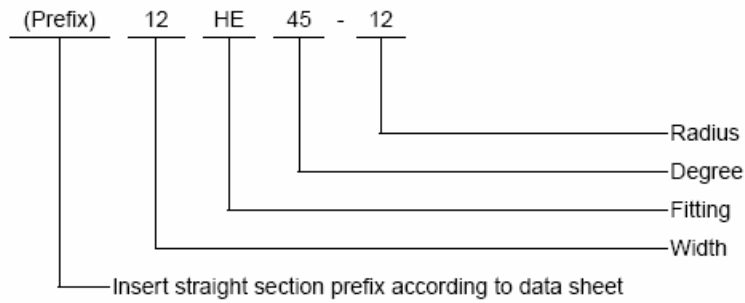
Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-HE90-12	90 Deg Horizontal Bend, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-HE90-12	90 Deg Horizontal Bend, Aluminum, Ladder, 12" Rad, 12" W x 4" D

Common Key Inputs				Component Specific Inputs								
Manufacturer	Material	TrayType	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	10		25		0in	90deg	12in	5		
698	5	5	10		25		0in	90deg	12in	5		

				Port Data											
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

3. Repeat the above steps to create the 45 Deg and 30 Deg Horizontal Elbow records.

Catalog Numbering System



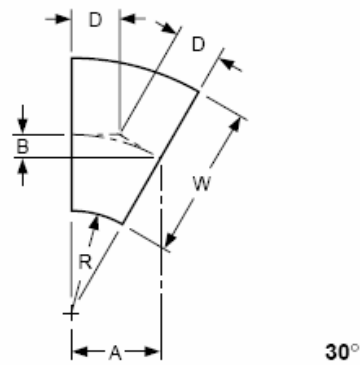
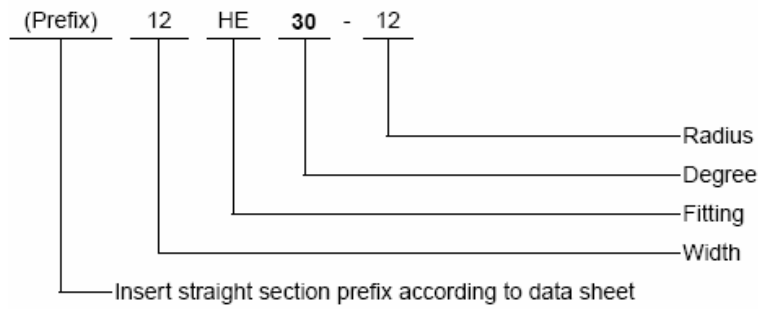
Bend Radius (R)		Width (W)		45 Degree Horizontal Bend		Outline Dimensions					
						A		B		D	
IN	mm	IN	mm	Catalog Number		IN	mm	IN	mm	IN	mm
12	305	6	152	Prefix	-06HE45-12	10.63	270	4.38	111	6.25	159
		12	305		-12HE45-12	12.75	324	5.25	133	7.50	191
		18	457		-18HE45-12	14.88	378	6.13	156	8.63	219
		24	610		-24HE45-12	17.00	432	7.00	178	10.00	254
		30	762		-30HE45-12	19.13	486	7.88	200	11.13	283
		36	914		-36HE45-12	21.25	540	8.75	222	12.38	314
24	610	6	152	Prefix	-06HE45-24	19.13	486	7.88	200	11.13	283
		12	305		-12HE45-24	21.25	540	8.75	222	12.38	314
		18	457		-18HE45-24	23.38	594	9.63	245	13.63	346
		24	610		-24HE45-24	25.50	648	10.50	267	14.88	378
		30	762		-30HE45-24	27.50	699	11.50	292	16.13	410
		36	914		-36HE45-24	29.63	753	12.38	314	17.38	441
36	762	6	152	Prefix	-06HE45-36	27.50	699	11.38	289	16.13	410
		12	305		-12HE45-36	29.63	753	12.25	311	17.38	441
		18	457		-18HE45-36	31.75	806	13.13	334	18.63	473
		24	610		-24HE45-36	34.00	864	14.00	356	19.88	505
		30	762		-30HE45-36	36.00	915	15.00	381	21.13	537
		36	914		-36HE45-36	38.13	969	15.88	403	22.38	568

Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-HE45-12	45 Deg Horizontal Bend, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-HE45-12	45 Deg Horizontal Bend, Aluminum, Ladder, 12" Rad, 12" W x 4" D

Common Key Inputs				Component Specific Inputs								
Manufacturer	Material	TrayType	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	40		25		0in	45deg	12in	5		
698	5	5	40		25		0in	45deg	12in	5		

Port Data															
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

Catalog Numbering System



Bend Radius (R)		Width (W)		30 Degree Horizontal Bend		Outline Dimensions					
						A		B		D	
IN	mm	IN	mm	Catalog Number		IN	mm	IN	mm	IN	mm
12	305	6	152	Prefix	-06HE30-12	7.50	191	2.00	51	4.00	102
		12	305		-12HE30-12	9.00	229	2.38	60	4.88	124
		18	457		-18HE30-12	10.50	267	2.88	73	5.63	133
		24	610		-24HE30-12	12.00	305	3.25	83	6.50	165
		30	762		-30HE30-12	13.50	343	3.63	92	7.25	184
		36	914		-36HE30-12	15.00	381	4.00	102	8.00	203
24	610	6	152	Prefix	-06HE30-24	13.50	343	3.63	92	7.25	184
		12	305		-12HE30-24	15.00	381	4.00	102	8.00	203
		18	457		-18HE30-24	16.50	419	4.38	111	8.88	226
		24	610		-24HE30-24	18.00	457	4.88	124	9.63	145
		30	762		-30HE30-24	19.50	495	5.25	133	10.50	267
		36	914		-36HE30-24	21.00	533	5.63	143	11.25	286
36	762	6	152	Prefix	-06HE30-36	19.50	495	5.25	133	10.50	267
		12	305		-12HE30-36	21.00	533	5.63	143	11.25	286
		18	457		-18HE30-36	22.50	572	6.00	152	12.13	308
		24	610		-24HE30-36	24.00	610	6.38	162	12.88	327
		30	762		-30HE30-36	25.50	648	6.88	175	13.63	346
		36	914		-36HE30-36	27.00	686	7.25	184	14.50	368

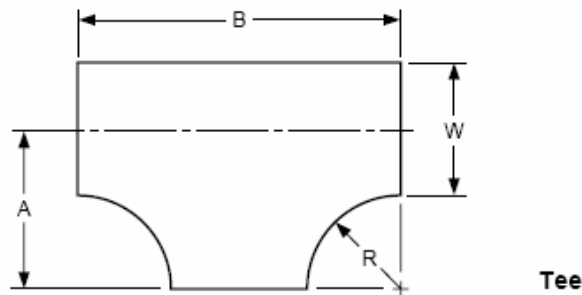
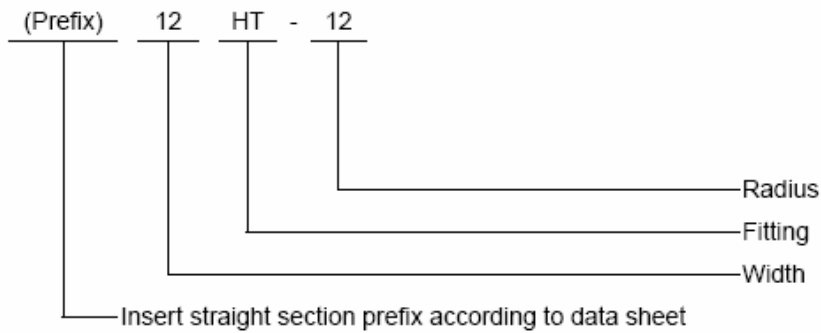
Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-HE30-12	30 Deg Horizontal Bend, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-HE30-12	30 Deg Horizontal Bend, Aluminum, Ladder, 12" Rad, 12" W x 4" D

Common Key Inputs				Component Specific Inputs								
Manufacturer	Material	TrayType	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	55		25		0in	30deg	12in	5		
698	5	5	55		25		0in	30deg	12in	5		

				Port Data											
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

- Repeat the above steps to create the Horizontal Tee and Cross records.

Catalog Numbering System



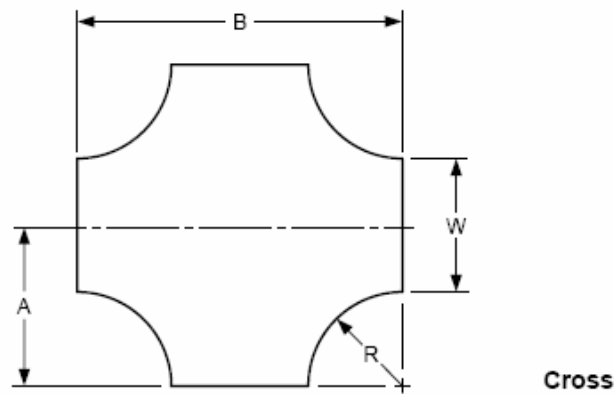
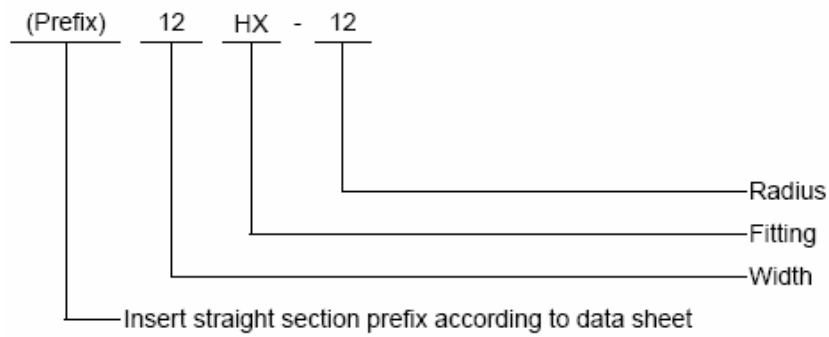
Bend Radius (R)		Width (W)		Horizontal Tee		Outline Dimensions			
				Catalog Number		A		B	
IN	mm	IN	mm			IN	mm	IN	mm
12	305	6	152	Prefix	-06HT-12	15.00	381	30.00	762
		12	305		-12HT-12	18.00	457	36.00	914
		18	457		-18HT-12	21.00	533	42.00	1067
		24	610		-24HT-12	24.00	610	48.00	1219
		30	762		-30HT-12	27.00	686	54.00	1372
		36	914		-36HT-12	30.00	762	60.00	1524
24	610	6	152	Prefix	-06HT-24	27.00	686	54.00	1372
		12	305		-12HT-24	30.00	762	60.00	1524
		18	457		-18HT-24	33.00	838	66.00	1676
		24	610		-24HT-24	36.00	914	72.00	1829
		30	762		-30HT-24	39.00	991	78.00	1981
		36	914		-36HT-24	42.00	1067	84.00	2134
36	762	6	152	Prefix	-06HT-36	39.00	991	78.00	1981
		12	305		-12HT-36	42.00	1067	84.00	2134
		18	457		-18HT-36	45.00	1143	90.00	2286
		24	610		-24HT-36	48.00	1219	96.00	2438
		30	762		-30HT-36	51.00	1295	102.00	2591
		36	914		-36HT-36	54.00	1372	108.00	2743

Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-HT-12	Horizontal Tee, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-HT-12	Horizontal Tee, Aluminum, Ladder, 12" Rad, 12" W x 4" D

Common Key Inputs				Component Specific Inputs									
Manufacturer	Material	Tray Type	Component Type	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber	
698	5	5	100		25	0in		12in	5				
698	5	5	100		25	0in		12in	5				

				Port Data																	
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]	NominalWidth[3]	NominalDepth[3]	ActualWidth[3]	ActualDepth[3]	LoadWidth[3]	LoadDepth[3]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

Catalog Numbering System



Bend Radius (R)		Width (W)		Horizontal Cross	Outline Dimensions			
					A		B	
IN	mm	IN	mm	Catalog Number	IN	mm	IN	mm
12	305	6	152	Prefix	-06HX-12	15.00	381	30.00
		12	305		-12HX-12	18.00	457	36.00
		18	457		-18HX-12	21.00	533	42.00
		24	610		-24HX-12	24.00	610	48.00
		30	762		-30HX-12	27.00	686	54.00
		36	914		-36HX-12	30.00	762	60.00
24	610	6	152	Prefix	-06HX-24	27.00	686	54.00
		12	305		-12HX-24	30.00	762	60.00
		18	457		-18HX-24	33.00	838	66.00
		24	610		-24HX-24	36.00	914	72.00
		30	762		-30HX-24	39.00	991	78.00
		36	914		-36HX-24	42.00	1067	84.00
36	762	6	152	Prefix	-06HX-36	39.00	991	78.00
		12	305		-12HX-36	42.00	1067	84.00
		18	457		-18HX-36	45.00	1143	90.00
		24	610		-24HX-36	48.00	1219	96.00
		30	762		-30HX-36	51.00	1295	102.00
		36	914		-36HX-36	54.00	1372	108.00

Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-HX-12	Horizontal Cross, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-HX-12	Horizontal Cross, Aluminum, Ladder, 12" Rad, 12" W x 4" D

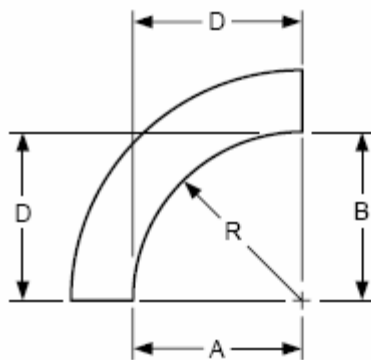
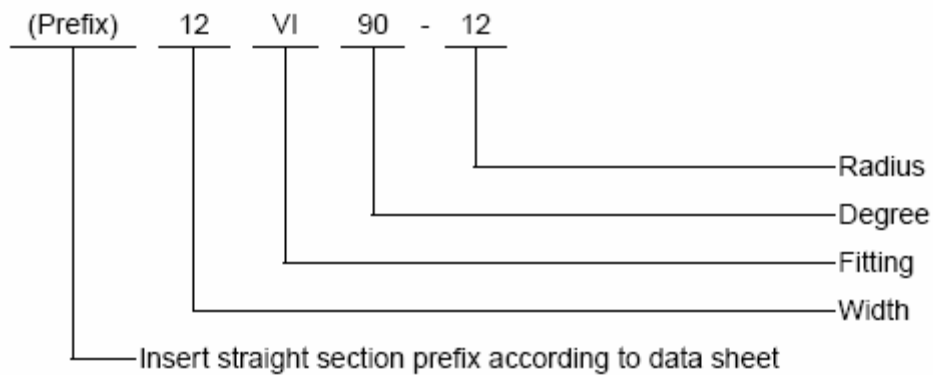
Common Key Inputs				Component Specific Inputs								
Manufacturer	Material	TrayType	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	135		25		0in		12in	5		
698	5	5	135		25		0in		12in	5		

Po															
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

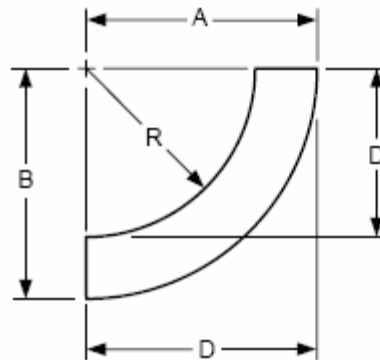
Port Data											
NominalWidth[3]	NominalDepth[3]	ActualWidth[3]	ActualDepth[3]	LoadWidth[3]	LoadDepth[3]	NominalWidth[4]	NominalDepth[4]	ActualWidth[4]	ActualDepth[4]	LoadWidth[4]	LoadDepth[4]
6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

- Repeat the above steps to create the Vertical Outside/Inside 90 Deg Elbow records.

Catalog Numbering System



Outside



Inside

90°

Bend Radius (R)		Catalog Number Add Appropriate Width (W) and Insert O or I in (★) For Outside/Inside Bend	Vertical Outside Bend Dimensions						Vertical Inside Bend – (Side Rail Height)																		
									3.63 in (92 mm)						4.63 in (118 mm)						6.00 in (152 mm)						
			A		B		D		A		B		D		A		B		D		A		B		D		
IN	m	IN	m	IN	m	IN	m	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm		
12	305	Prefix	-(W) V (★) 90-12	12.00	305	12.00	305	12.00	305	15.63	397	15.63	397	15.63	397	16.63	422	16.63	422	16.63	422	18.00	457	18.00	457	18.00	457
24	610		-(W) V (★) 90-24	24.00	610	24.00	610	24.00	610	27.63	702	27.63	702	27.63	702	28.63	727	28.63	727	28.63	727	30.00	762	30.00	762	30.00	762
36	914		-(W) V (★) 90-36	36.00	914	36.00	914	36.00	914	39.63	1007	39.63	1007	39.63	1007	40.63	1032	40.63	1032	40.63	1032	42.00	1067	42.00	1067	42.00	1067

90 Deg Vertical Outside Bend:

Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-V090-12	90 Deg Vertical Outside Bend, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-V090-12	90 Deg Vertical Outside Bend, Aluminum, Ladder, 12" Rad, 12" W x 4" D

Common Key Inputs				Component Specific Inputs								
Manufacturer	Material	TrayType	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	20		25		0in	90deg	12in	5		
698	5	5	20		25		0in	90deg	12in	5		

				Port Data											
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

90 Deg Vertical Inside Bend:

Head	PartNumber	PartDescription
Start		
a	CLA4JD-06-VI90-12	90 Deg Vertical Inside Bend, Aluminum, Ladder, 12" Rad, 6" W x 4" D
a	CLA4JD-12-VI90-12	90 Deg Vertical Inside Bend, Aluminum, Ladder, 12" Rad, 12" W x 4" D

Common Key Inputs				Component Specific Inputs								
Manufacturer	Material	TrayType	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	PartDataBasis	ReplacementPartNumber
698	5	5	15		25		0in	90deg	12in	5		
698	5	5	15		25		0in	90deg	12in	5		

				Port Data											
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]	NominalWidth[2]	NominalDepth[2]	ActualWidth[2]	ActualDepth[2]	LoadWidth[2]	LoadDepth[2]
6in	4in			6in	4in	6in	4.63in	6in	4in	6in	4in	6in	4.63in	6in	4in
12in	4in			12in	4in	12in	4.63in	12in	4in	12in	4in	12in	4.63in	12in	4in

6. Save the workbook as Cabletray2.xls
7. Select Start => Programs => Intergraph SmartPlant3D => Database Tools => Bulkload Reference Data.
8. The Bulkload Utility form will appear.

7. Select the “Add” option under “Excel Files” and select Cabletray2.xls
8. Select the appropriate Database Type.
9. Select the appropriate Server Name and Select an existing catalog.
10. Load the records into the database using the “Add/Modify/Delete” mode.

Bulkload

Reference data to bulkload

Excel files:
D:\electricalref\CableTray2.xls

Excel codelist files:

Bulkload mode

☐ Bulkload to a new catalog

☐ Append to existing catalog

☒ Add, modify, or delete records in existing catalog

☐ Delete and replace records in existing catalog

Create flavors

Catalog information

Database Type: MSSQL

Database server name: rhd703\rhd703

Database name: SP3DTrain_cat

Schema information

Catalog schema server: rhd703\rhd703

Catalog schema database: SP3DTrain_cat_SCHEMA

Log file:
D:\electricalref\SP3DTrain_cat.log

Symbol and custom program file location:
\\rhd703\symbols

Buttons: Load, Reset, Close, Add..., Delete, Add..., Delete

11. Review the log file for the load.

12. Open a SP3D session and go to System and Specification Task to make available the new spec in system hierarchy of the model.

SP3DTrain

A1

A2

CS

Name	Type
A1	Area System
A2	Area System
CS	Generic System

Define Allowed Specifications

Allowed by parent system:

Catalog

Category	Name	Description
- Cableway	SD-CLA4JD-12-1	Square D, Aluminum, 6" L

Buttons: Add >>, << Remove, Clear All, Add All

Allowed for selected system:

SP3DTrain

Category	Name	Description
+ Cableway		
+ Ducting		
+ Piping		
+ Piping Insulation		
+ Conduit		

Buttons: OK, Cancel

13. Go to the Electrical Task and route the new cabletray spec.

Lab 2: Conduit Specification

Objective

After completing this lab, you will be able to:

- Create a new Conduit Specification

Allied ALUMINUM Rigid Specifications



Weights and Dimensions for Rigid Aluminum Conduit

Trade Size Designator		Approx. Wt. Per 100 Ft. (30.5M)		Nominal Outside Diameter		Nominal Wall Thickness		Quantity In Master Bundle	
U.S.	Metric	lb.	kg	in.	mm	in.	mm	ft.	m
1/2	16	28.1	12.7	0.840	21.3	0.104	2.64	2500	762.5
3/4	21	37.4	17.0	1.050	26.7	0.107	2.72	2500	762.5
1	27	54.5	24.7	1.315	33.4	0.126	3.20	2000	610.0
1-1/4	35	71.6	32.5	1.660	42.2	0.133	3.38	1000	304.8
1-1/2	41	88.7	40.2	1.900	48.3	0.138	3.51	1000	304.8
2	53	118.5	53.8	2.375	60.3	0.146	3.71	450	137.2
2-1/2	63	187.5	85.0	2.875	73.0	0.193	4.90	300	91.5
3	78	246.3	111.7	3.500	88.9	0.205	5.21	200	61.0
3-1/2	91	295.6	134.1	4.000	101.6	0.215	5.46	200	61.0
4	103	350.2	155.8	4.500	114.3	0.225	5.72	200	61.0
5	129	478.9	217.2	5.563	141.3	0.245	6.22	80	23.4
6	155	630.4	285.9	6.625	168.3	0.266	6.76	60	18.3

Note: This lab is intended as a basic introduction to spec creation. As such it is limited to straight conduits, couplings and bends (90 and 45 degree elbows). It is not intended as an example of a functional design spec.

Creating the Conduit Specification Rigid Metal Conduit (RMC) Bulkload Worksheet

1. Open the Conduit.xls and AllCodeList.xls files located in <Install Directory>\CatalogData\BulkLoad\DataFiles
2. Select the following worksheets while holding down the control key:
 - a. CustomInterfaces
 - b. ConduitFilter
 - c. ConduitSpec
 - d. ConduitNominalDiameters
 - e. ConduitCommodityMatlControlData
 - f. ConduitStock
 - g. ConduitCPL
 - h. PlainPipingGenericData

- i. PipingGenericDataFemale
 - j. GUIDs
3. Save the worksheets to a new Excel Workbook named “RMC.xls”

Editing Conduit Spec

1. Open the ConduitSpec sheet in the RMC.xls workbook.
2. Add the following data in the columns noted for the new conduit specification.
 - a. SpecName : RMC
 - b. Material : Rigid Metal Conduit, Aluminum
 - c. Service: Equipment wiring

Head	SpecName	Material	Service
!			
Start			
a	RMC	Rigid Metal Conduit, Aluminum	Equipment wiring

Editing Conduit Nominal Diameters Data

1. Open the ConduitNominalDiameters sheet.
2. Add records for the new specification as shown below:

Head	SpecName	Npd	NpdUnitType
!			
Start			
a	RMC	0.5 in	
a		1 in	
a		2 in	
End			

Creating Conduit Filter Records

1. Open the ConduitFilter sheet.
2. Add records for conduits, tees, and couplings as shown below:

Item	Size	Schd	Commodity Code	Description
Conduit	0.5" – 0.5"	0.84"	RMC000001	Rigid Metal Conduit, PE, Aluminum
Conduit	1" – 1"	1.315"	RMC000001	Rigid Metal Conduit, PE, Aluminum
Conduit	2" – 2"	2.375"	RMC000001	Rigid Metal Conduit, PE, Aluminum
Bend	0.5" – 0.5"	0.84"	RMC000001	Rigid Metal Conduit, PE, Aluminum
Bend	1" – 1"	1.315"	RMC000001	Rigid Metal Conduit, PE, Aluminum
Bend	2" – 2"	2.375"	RMC000001	Rigid Metal Conduit, PE, Aluminum
Coupling	0.5" - 2"		RMC000002	Conduit Coupling, Female Threaded

Head	SpecName	ShortCode	Comments	FirstSizeFrom	FirstSizeTo	FirstSizeUnits	SecondSizeFrom	SecondSizeTo	SecondSizeunits	CommodityOption	ContractorCommodityCode	BendRadius	BendRadiusMultiplier	SelectionBasis
Start														
	RMC													
	Conduit	Straight Conduit	0.5	2	in				in	1	RMC000001			1
	Conduit Bend	Conduit Bend	0.5	2	in				in	1	RMC000001		5	5
	45 Degree Elbow	Conduit Bend	0.5	2	in				in	1	RMC000001		5	5
	90 Degree Elbow	Conduit Bend	0.5	2	in				in	1	RMC000001		5	5
	Coupling	Coupling	0.5	2	in				in	1	RMC000002			1

Editing ConduitCommodityMatlControlData Data

1. Open the ConduitCommodityMatlControlData sheet.

Add records for the new specification as shown below:

Head	ContractorCommodityCode	FirstSizeFrom	FirstSizeTo	FirstSizeUnits	IndustryCommodityCode	ClientCommodityCode	ShortMaterialDescription	LocalizedShortMaterialDesc	FabricationType	GasketRequirements	BoltingRequirements
Start											
a	RMC000001				RMC000001		Tube, PE, Aluminum		7	20	35
a	RMC000002				RMC000002		Conduit Coupling		7	20	35

Editing ConduitStock Part Class

1. Open the ConduitStock sheet.

Add records for the new specification as shown below:

Head	IndustryCommodityCode	FirstSizeSchedule	CommodityType	GraphicalRepresentationOrNot	MaterialGrade	Density	PurchaseLength	LiningMaterial	EndPreparation[1]	EndStandard[1]	ScheduleThickness[1]	EndPreparation[2]	EndStandard[2]	ScheduleThickness[2]	Npd[1]:Primary	NpdUnitType[1]	Npd[2]:Secondary	NpdUnitType[2]
Start																		
a	RMC000001		Conduit		1780	100lbm/ft^3	10ft		331	987	0.84"	331	987	0.84"	0.5	in	0.5	in
a	RMC000001		Conduit		1780	100lbm/ft^3	10ft		331	987	1.315"	331	987	1.315"	1	in	1	in
a	RMC000001		Conduit		1780	100lbm/ft^3	10ft		331	987	2.375"	331	987	2.375"	2	in	2	in

Editing Schedule Thickness

1. Open the AllCodeList.xls. Go to the ScheduleThickness sheet.

Add records for the new schedule thickness as shown below:

HEAD	Schedule	Thickness	Practice	Schedule	Thickness	Practice	Schedule	Thickness	Schedule	Thickness	Code	Sort
	Short	Description	Long	Description	Short	Description	Long	Description	Long	Description	Number	Order
START												
	Undefined				Undefined		Undefined				1	
											1	
	Not Required										2	
											2	
	US Practice										5	
a					0.84"		0.84" wall thickness				10001	
a					1.315"		1.315" wall thickness				10002	

2. Save the worksheet.

Editing Plain Piping Generic Data

1. Open the PlainPipingGenericData sheet.
2. Use the following Data to create the Plain piping Generic Data

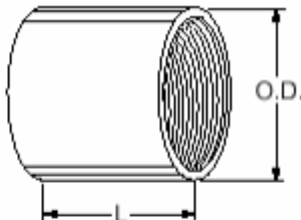
Rigid Metal Conduit and Fittings															
Weights and Dimensions for Rigid Aluminum Conduit (RMC)															
Trade Designator		Approx. Wt. Per		Nominal Outside		Nominal Wall		Quantity in Primary		Quantity		Master Bundles		Total Traverse	
Size		100 Ft. (30.5 m)		Diameter		Thickness		Bundle				Approx Wt. ¹		Area	
U.S.	Metric	lb.	kg	in.	mm	in.	mm	ft.	m	ft.	mm	lb.	kg	in. ²	mm ²
1/2	16	28.1	12.7	0.84	21.3	0.104	2.64	100	30.5	2500	762.5	706	318.4	0.31	202
3/4	21	37.4	17	1.05	26.7	0.107	2.72	100	30.5	2500	762.5	935	424.1	0.549	355
1	27	54.5	24.7	1.315	33.4	0.126	3.2	100	30.5	2000	610	1090	494.4	0.887	573
1 1/4	35	71.6	32.5	1.66	42.2	0.133	3.38	50	15.2	1000	304.8	716	324.8	1.53	986
1 1/2	41	88.7	40.2	1.9	48.3	0.138	3.51	50	15.2	1000	304.8	887	402.3	2.07	1,340
2	53	118.5	53.8	2.375	60.3	0.146	3.71	50	15.2	450	137.2	533.3	241.9	3.41	2,200
2 1/2	63	187.5	85	2.875	73	0.193	4.9	–	–	300	91.5	567.5	257.4	4.87	3,140
3	78	246.3	111.7	3.5	88.9	0.205	5.21	–	–	200	61	492.6	223.4	7.5	4,840
3 1/2	91	296.6	134.1	4	101.6	0.215	5.46	–	–	200	61	591.2	268.2	10	6,460
4	103	350.2	155.8	4.5	114.3	0.225	5.72	–	–	200	61	700.4	317.7	12.9	8,310
5	129	478.9	217.2	5.563	141.3	0.245	6.22	–	–	80	23.4	383.1	173.8	20.2	13,040
6	155	630.4	285.9	6.625	168.3	0.266	6.76	–	–	60	18.3	378.2	171.6	29.2	18,820

3. Add records for the new specification as shown below:

Head	NominalPipingDiameter	NominalDiameterUnits	EndStandard	Schedule	PressureRating	PipingOutsideDiameter	WallThickness
Start							
a	0.5	in	987	0.84"		0.84in	0.104in
a	1	in	987	1.315"		1.315in	0.126in
a	2	in	987	2.375"		2.375in	0.146in

Editing ConduitCPL Part Class

1. Open the ConduitCPL sheet.
2. Review the following coupling dimension data

								
Rigid Aluminum Conduit - Coupling Dimension Data								
Trade Size Designator		Approximate Weight per 100 Ft. (30.5M)		Nominal Outside Diameter		Length		Standard Package
U.S.	Metric	lb.	kg.	in.	mm	in.	mm	Pieces
1/2	16	6.1	2.8	1.08	27.4	1.56	39.6	100
3/4	21	9.1	4.1	1.33	33.8	1.62	41.1	50
1	27	12.5	5.7	1.56	39.6	2	50.8	30
1 1/4	35	18.9	8.6	1.95	49.5	2.06	52.3	25
1 1/2	41	23.3	10.6	2.22	56.4	2.06	52.3	25
2	53	34.6	15.7	2.75	69.8	2.12	53.8	15
2 1/2	63	68.3	31	3.28	83.3	3.12	79.2	20
3	78	91.4	41.5	3.94	100.8	3.25	82.6	15
3 1/2 91	108	49	4.44	112.8	3.37	85.6	12	
4	103	142	64.4	5	127	3.5	88.9	12
5	129	241.9	109.7	6.3	160	3.75	95.3	8
6	155	321	145.6	7.39	187.7	4	101.6	6

Head	IndustryCommodityCode	CommodityType	GraphicalRepresentationOrNot	SymbolDefinition	MaterialGrade	LiningMaterial	BendAngle	BendRadius	BendRadiusMultiplier	PipingPointBasis[1]	Id[1]	EndPreparation[1]	EndStandard[1]	ScheduleThickness[1]	PipingPointBasis[2]	Id[2]	EndPreparation[2]	EndStandard[2]	ScheduleThickness[2]	DryWeight	Npd[1]:Primary	NpdUnitType[1]	Npd[2]:Secondary	NpdUnitType[2]	FacetoFace
Start																									
a	RMC000002	Conduit CPL			1780					130	441	987	0.84"	130	441	987	0.84"		0.5 in	0.5 in	1.56in				
a	RMC000002	Conduit CPL			1780					130	441	987	1.315"	130	441	987	1.315"		1 in	1 in	2in				
a	RMC000002	Conduit CPL			1780					130	441	987	2.375"	130	441	987	2.375"		2 in	2 in	2.12in				

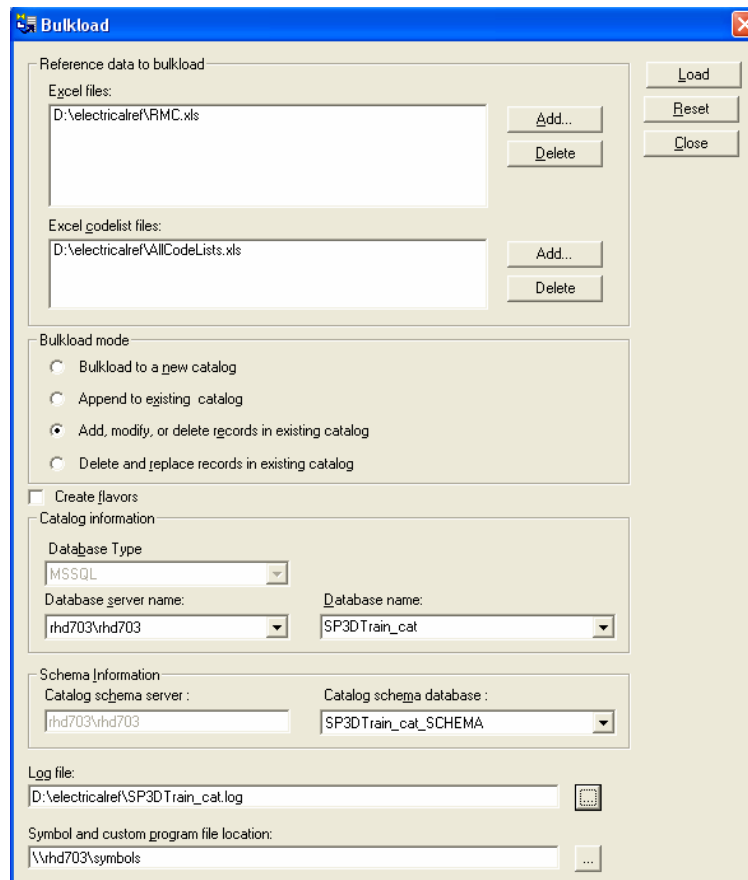
Editing PipingGenericDataFemale

1. Open the PipingGenericDataFemale sheet.

Add records for the new specification as shown below:

Head	NominalPipingDiameter	NominalDiameterUnits	PressureRating	Schedule	EndPreparation	EndStandard	SocketDiameter	SocketDepth	SocketOffset	ThreadDepth	HubOutsideDiameter	HubThickness	BodyOutsideDiameter
Start													
a	0.5	in	0.84"	441	987	1.038in				0.5in	1.5in	0.625in	1.25in
a	1	in	1.315"	441	987	1.5768in				0.6875in	2.19in	0.8125in	1.94in
a	2	in	2.375"	441	987	2.6563in				0.75in	3.31in	0.875in	3.06in

2. Save the workbook.
3. Select Start => Programs => Intergraph SmartPlant3D => Database Tools => Bulkload Reference Data.
4. Select the "Add" option under "Excel Files" and select RMC.xls
5. Select the "Add" option under "Excel Codelist Files" and select Allcodelist.xls
6. Select an existing catalog.
7. Load the records into the database using the "Add/Modify/Delete" mode.



Bulkload

Reference data to bulkload

Excel files:

D:\electricalref\RMCM.xls

Add... Delete

Excelodelist files:

D:\electricalref\AllCodeLists.xls

Add... Delete

Bulkload mode

☐ Bulkload to a new catalog

☐ Append to existing catalog

☒ Add, modify, or delete records in existing catalog

☐ Delete and replace records in existing catalog

☐ Create flavors

Catalog information

Database Type: MSSQL

Database server name: rhd703\rhd703

Database name: SP3DTrain_cat

Schema information

Catalog schema server: rhd703\rhd703

Catalog schema database: SP3DTrain_cat_SCHEMA

Log file:

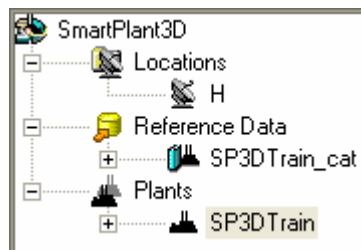
D:\electricalref\SP3DTrain_cat.log

Symbol and custom program file location:

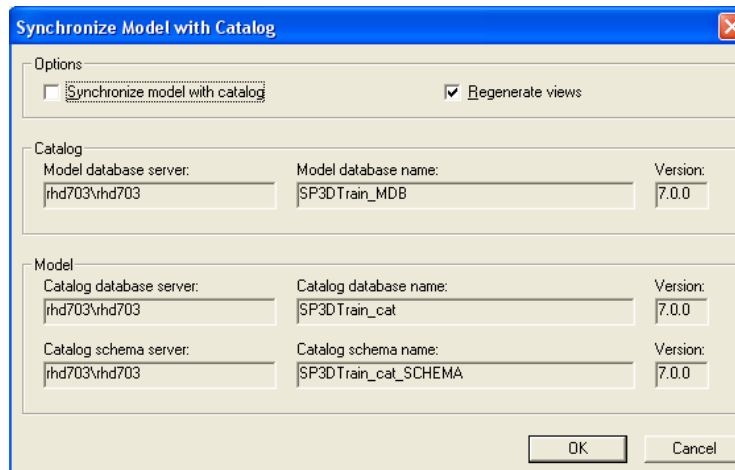
\\rhd703\symbols

Load Reset Close

8. Once the bulkload process is complete, review the log file.
9. Select Start => Programs => Intergraph SmartPlant3D => Project Management.
10. Select the plant under the hierarchy.

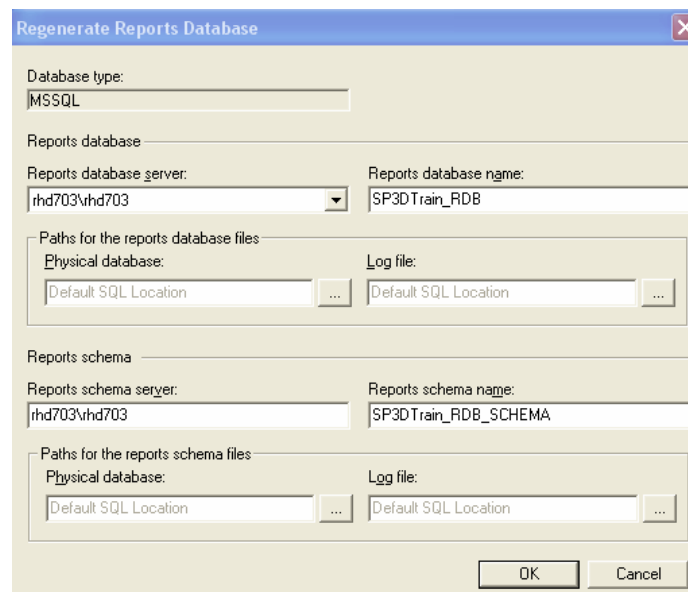


11. Select Synchronize Model with Catalog option. Uncheck the Synchronize model with catalog option. Make sure to check the regenerate views option.



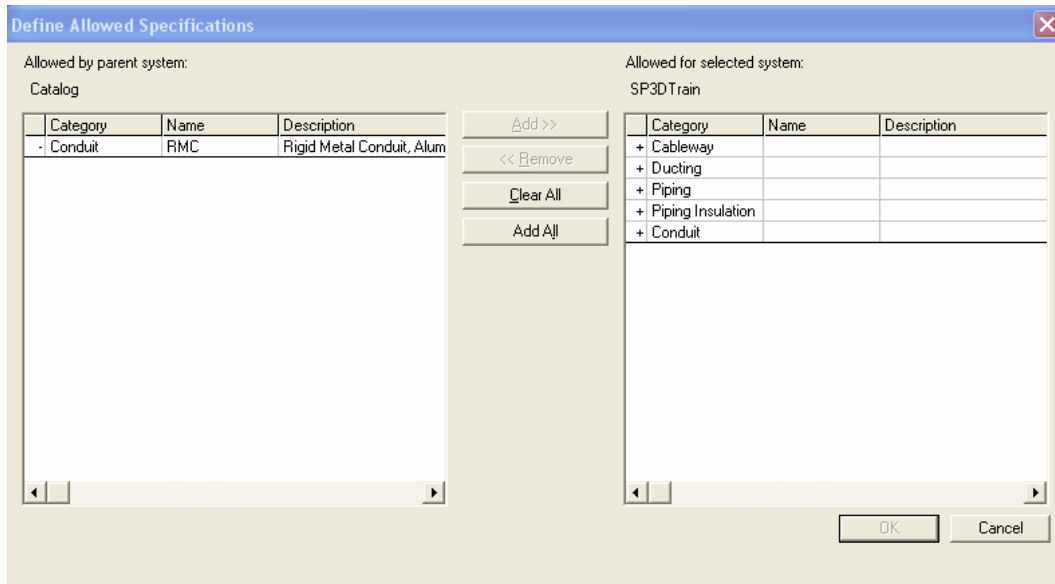
12. Hit OK to start the process..

13. Right mouse click the training plant icon and select Regenerate the reports databases.

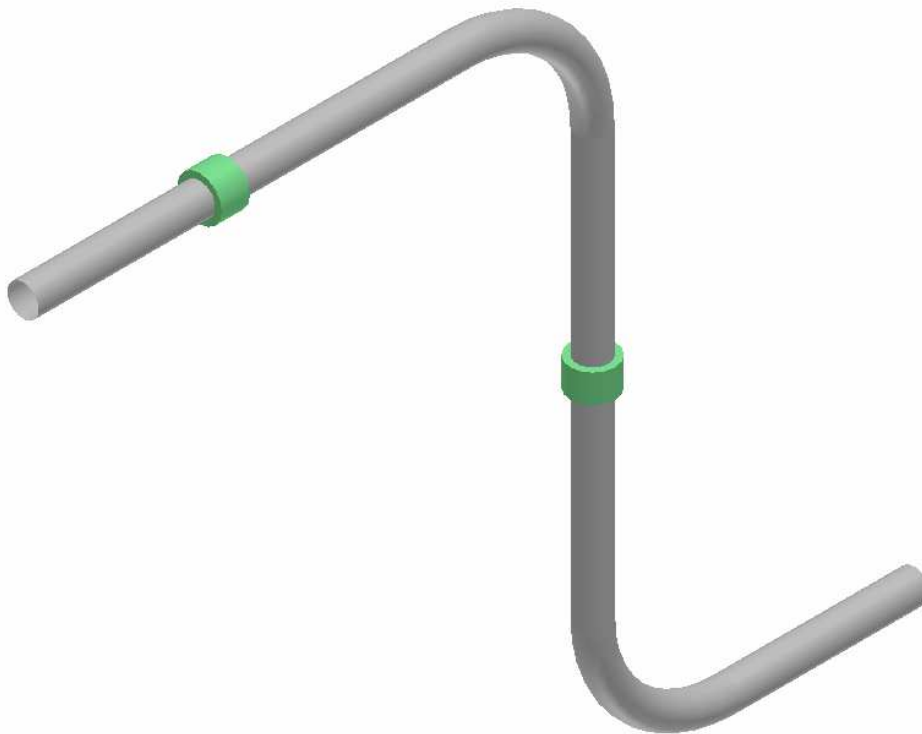


14. Hit OK to start the process.

15. Open a SP3D session and go to System and Specification Task to make available the new spec in system hierarchy of the model.



16. Go to the Electrical Task and route the new conduit spec.



Lab 3: Cable Part Class

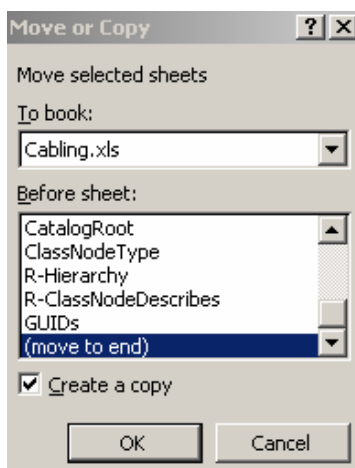
Objective

After completing this lab, you will be able to:

- Add a new Cable Part Class (Flat Conductor Cables)
 1. Open the Cabling.xls file located in <Install Product>\CatalogData\BulkLoad\DataFiles and save this workbook as Cabling2.xls
 2. Go the R-ClassNodeDescribes sheet and add the following entry.

Head	<u>RelationSource</u>	<u>RelationDestination</u>
Start		
	CablesNode	PowerCables
	CablesNode	CommunicationCables
	CablesNode	RadioFrequencyCables
	CablesNode	FiberOpticCables
	CablesNode	HybridCables
a	CablesNode	FlatConductorCables
End		

3. Save the sheet.
4. Copy the PowerCables Class by doing the following:
Select the PowerCables Sheet. Right Click to Open the Move or Copy dialog box. Enable the copy option. Select the OK button to copy the sheet before the GUID sheet.



5. Rename the sheet as FlatConductorCables



- Rename User Class Name, Occ Class Name, part number and description of this class as follows:

Definition	<u>PartClassType</u>	<u>UserClassName</u>	<u>OccClassName</u>
	CablePartClass	FlatConductorCables	FlatConductorCables
<u>PartNumber</u>	<u>PartDescription</u>		
FCSJ-16	Flat Conductor cable -Tyco Electronics Corp.		

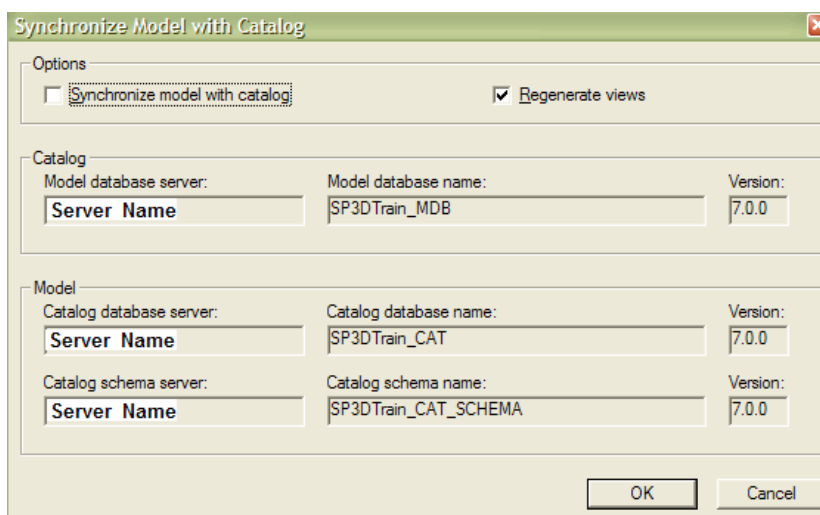
- Edit the common and custom properties as follows:

<u>UnitWeight</u>	<u>MinBendRadius</u>	<u>CableDiameter</u>	<u>NoOfConductors</u>	<u>SizeOfConductors</u>	<u>RatedVoltage</u>	<u>InsulationType</u>
10	0.005	0.05	4	610	400	Dry Kraft paper Tapes

Delete the others columns.

- Save the changes to a new workbook called Cabling2.xls and use the Bulkload Utility to load the new class. Remember to add the letter A to all sheets.
- Once the bulkload process is complete, run the Project Management Task. Select the Model in the hierarchy.
- Select Tools -> Synchronize Model with the Catalog.
- Uncheck the Synchronize Model with the Catalog option.

Note: You just need to update the views in the model.



- Hit "OK" Button.
- Once the process is complete. Right click on the model and select regenerate the report database.

14. Hit “OK” Button.

15. Go to the Electrical Task and place the new cable.

Appendix

This appendix provides reference information and procedural instructions on how to create symbols for electrical objects. For more information on this topic, attend the SmartPlant 3D Programming I (TSMP4001) class.

After completing these exercises, you will be able to:

- Add code list value
 - Create a cabletray symbol
 - Create a conduit symbol
1. Open the AllCodeList.xls Excel Workbook.
This file is located in ..\CatalogData\BulkLoad\Datafiles
 2. Go to CableTrayComponentType sheet
 3. Add a Frame Type Box connector (305) in the End Fitting Cable tray Component Class section as follows:

HEAD	CableTrayComponentClass	CableTrayComponentClass	CableTrayComponentType	CableTrayComponentType	Codelist
	ShortDescription	LongDescription	ShortDescription	LongDescription	
START					
	Straight Sections				5
			Straight	Straight	5
	Direction Change Fittings				10
	Tee-Type Branch Fittings				15
	Reducing Fittings				20
	End Fittings				25
			Blind end plate	Blind end plate	300
a			Frame Type Box Connector	Frame Type Box Connector	305

4. Save the changes and use the Bulkload Utility to load the new code list value. Remember to add the letter A to the row.
5. Once the bulkload process is complete, run the Project Management Task. Select the Model in the hierarchy.
6. Select Tools -> Synchronize Model with the Catalog.
7. Uncheck the Synchronize Model with the Catalog option.

Note: You just need to update the views in the model.

Synchronize Model with Catalog

Options

☐ Synchronize model with catalog ☒ Regenerate views

Catalog

Model database server:	Model database name:	Version:
Server Name	SP3DTrain_MDB	7.0.0

Model

Catalog database server:	Catalog database name:	Version:
Server Name	SP3DTrain_CAT	7.0.0
Catalog schema server:	Catalog schema name:	Version:
Server Name	SP3DTrain_CAT_SCHEMA	7.0.0

OK Cancel

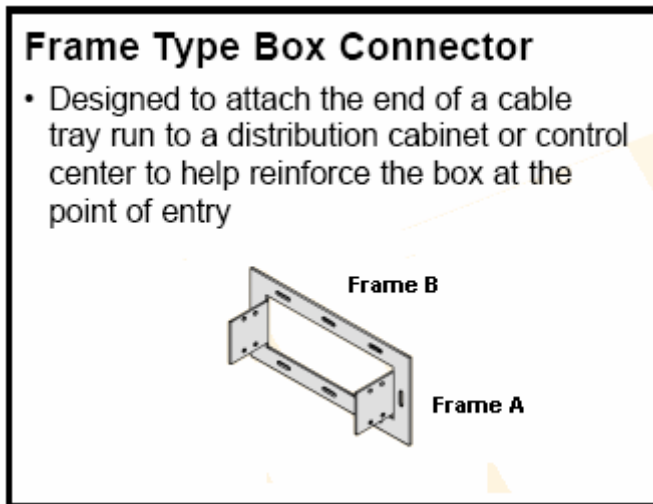
16. Hit “OK” Button.

17. Once the process is complete. Right click on the model and select regenerate the report database.

18. Hit “OK” Button.

Box Connector Symbol

- Create a Frame Box Connector using the SmartPlant 3D Part Definition VB Wizard

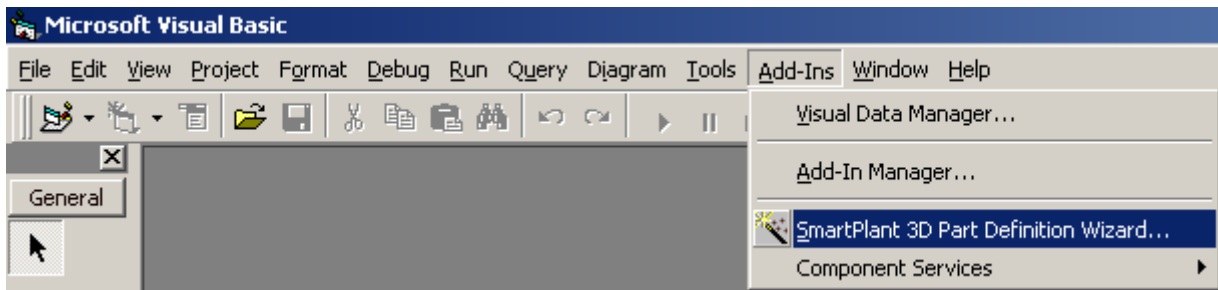


Skip the following lines if the symbol wizard is installed on your machine.

1. Go to [Install Directory]\Programming\Tools\SymbolWizard
2. Install SP3D VB Symbol Wizard in device c:\Program Files\ SP3D Symbol Wizard
3. Create Company Catalog Directories in device c:\train
c:\train\bin
c:\train\IngrModules
c:\train\CompanyModules
c:\train\SP3DFrameBox
4. Run Microsoft Visual Basic 6.0. Close the Microsoft New Project dialog box.



5. Go to the Add-Ins Option and Select SmartPlant 3D Part Definition Wizard.



6. Select Next button to skip the Introduction page. The Next step is to create the SP3DFrameBox symbol definition template using SP3D part Definition VB Symbol Wizard.
7. In this page you define the VB project name. Key in the following information:

Project Name: SP3DFrameBox
 Author: Student
 Company: Intergraph
 Intergraph Module location: c:\Train\IngrModules
 Save the VB project as: c:\Train\SP3DFrameBox

SmartPlant 3D Part Definition Wizard - Project Definition

Identify the Visual Basic project to be created.

Project name: SP3DFrameBox Class name: CSP3DFrameBox

Project description: Ingr SmartPlant 3D Symbol

Author: Student Company: Intergraph

Intergraph common module location: C:\train\IngrModules ...

Custom common module location: ...

Save project as: C:\train\SP3DFrameBox\SP3DFrameBox.vbp ...

☐ Create bulkload spreadsheet

Help Cancel < Back Next > Finish

8. Select Next button to go the next page. This page is to define any input properties that are defined in the part class that are constant for all occurrences. We are going to define two attributes for our SP3DFrameBox. Key in the following data:

SmartPlant 3D Part Definition Wizard - Part Definition Properties

Define any properties that are constant for all occurrences of the part. You must correlate each property name with a variable name and indicate the data type.

Definition properties:

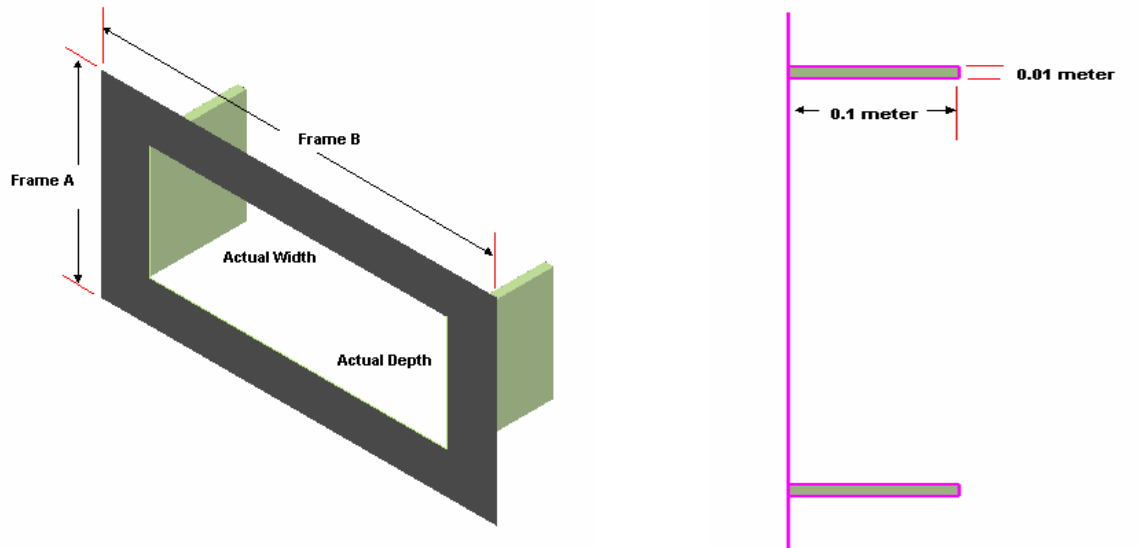
Interface Name	Attribute Name	Attribute User Name	Data Type	
IJUASP3DFrameBox	FrameA	FrameA	Double	Dis
IJUASP3DFrameBox	FrameB	FrameB	Double	Dis

SmartPlant 3D Part Definition Wizard - Part Definition Properties

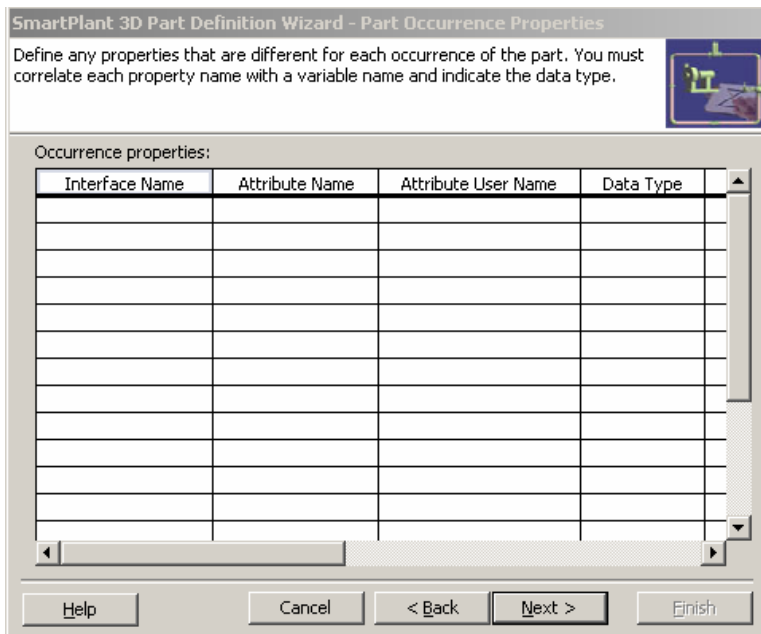
Define any properties that are constant for all occurrences of the part. You must correlate each property name with a variable name and indicate the data type.

Definition properties:

Unit Type	m	Description	Default	Symbol Parameter
Distance	m	Frame Depth	4	FrameA
Distance	m	Frame Width	4	FrameB



9. Select Next button to go the next page. Skip this page because our cabletray part does not have occurrence attributes.



10. Select Next button to go the next page. This page identifies all the outputs of the cabletray part. We are going to define one output and one port for our SP3DFrameBox. The output is in the simple Physical aspect. We are going to add the cabletray port code manually because the current symbol wizard does not have this option.

SmartPlant 3D Part Definition Wizard - Outputs

Identify any outputs on the part. In the Visual Basic project, you will need to write code to define the geometry and position of each of these outputs.

Nozzles: Nozzle type:

Outputs:

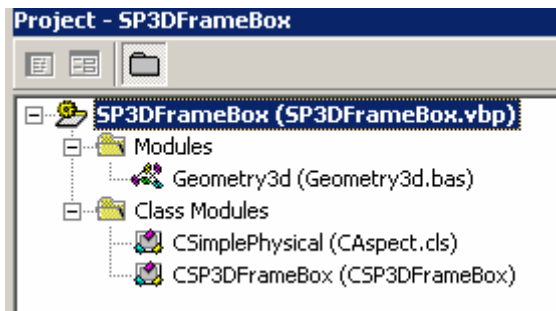
A	B	C
Name	Description	Type
Body1	Body1	Body

Aspects in which the selected output will be displayed:

☒ Simple physical
☐ Detailed physical
☐ Insulation
☐ Operation
☐ Maintenance

Help Cancel < Back Next > Finish

- Hit Next button and Finish button to create the SP3DFrameBox project template. The VB project consists of the following modules:



- Open the **CSP3DFrameBox Class** module. This Class contains several routines.
- Go to the Class_Initialize() routine in the input section. Review the inputs and add one output definition for the cabletray port as shown below.

```
Private Sub Class_Initialize()
    Const METHOD = "Class_Initialize:"
    On Error GoTo Errx

    Set m_oSymbolHelper = New SymbolServices
    m_oSymbolHelper.ProjectName = "SP3DFrameBox"
    m_oSymbolHelper.ClassName = "CSP3DFrameBox"
```

' Inputs

```

m_oSymbolHelper.NumInputs = 2
m_oSymbolHelper.AddInputDef 1, "FrameA", "Frame Depth", 4
m_oSymbolHelper.AddInputDef 2, "FrameB", "Frame Width", 4

' Outputs
  m_oSymbolHelper.NumOutputs = 2
  m_oSymbolHelper.AddOutputDef 1, "Body1", "Body1", 1
  m_oSymbolHelper.AddOutputDef 2, "port1", "Port1", 1

' Aspects
  m_oSymbolHelper.NumAspects = 1
  m_oSymbolHelper.AddAspectDef 1, "SimplePhysical", "SimplePhysical", 1

Exit Sub
Errx:
  Err.Raise Err.Number, Err.Source & " " & METHOD, Err.Description, _
    Err.HelpFile, Err.HelpContext
End Sub

```

14. Go to **CSimplePhysical Class** module and add your code to create the outputs:
15. Go to the Insert your code for output 1 (Body1) section. The following code will use the 3D geometry factory to create a frame. Use the 3D geometry factory to create a 3D plane using the Frame A and Frame B dimensions.

```

Set oPartFclt = arrayOfInputs(1)
parFrameA = arrayOfInputs(2)
parFrameB = arrayOfInputs(3)
m_oGeomHelper.OutputCollection = m_OutputColl

iOutput = 0

Dim oTrayPart As IJCableTrayPart
Set oTrayPart = oPartFclt

Dim Points(0 To 11) As Double
Dim geomFactory As New IngrGeom3D.GeometryFactory
Dim ObjBody1 As IngrGeom3D.Plane3d

Points(0) = 0
Points(1) = parFrameB / 2
Points(2) = parFrameA / 2
Points(3) = 0
Points(4) = -parFrameB / 2
Points(5) = parFrameA / 2
Points(6) = 0
Points(7) = -parFrameB / 2
Points(8) = -parFrameA / 2
Points(9) = 0
Points(10) = parFrameB / 2
Points(11) = -parFrameA / 2
Set ObjBody1 = geomFactory.Planes3d.CreateByPoints(m_OutputColl.ResourceManager, 4, Points)

```

Note: Go to the declaration section and delete this statement Dim ObjBody1 As Object

16. The following code will use the CreateCableTrayPort() method to create the cabletray port.

```

Dim oDir As AutoMath.DVector
Dim oRadialOrient As AutoMath.DVector
Dim objCableTrayPort As GSCADNozzleEntities.IJCableTrayPortOcc
Set oDir = New AutoMath.DVector
Set oRadialOrient = New AutoMath.DVector

oDir.Set -1, 0, 0
oRadialOrient.Set 0, 0, 1
Set objCableTrayPort = CreateCableTrayPort(oPartFclt, 1, CenterPos, oDir, _
                                           oRadialOrient, m_OutputColl)

' Set the output
iOutput = iOutput + 1
m_OutputColl.AddOutput arrayOfOutputs(iOutput), objCableTrayPort

```

Use the Set statement to clear the references from all object variables.

```

Set objCableTrayPort = Nothing
Set CenterPos = Nothing
Set oDir = Nothing
Set oRadialOrient = Nothing
Set geomFactory = Nothing
Set ObjBody1 = Nothing

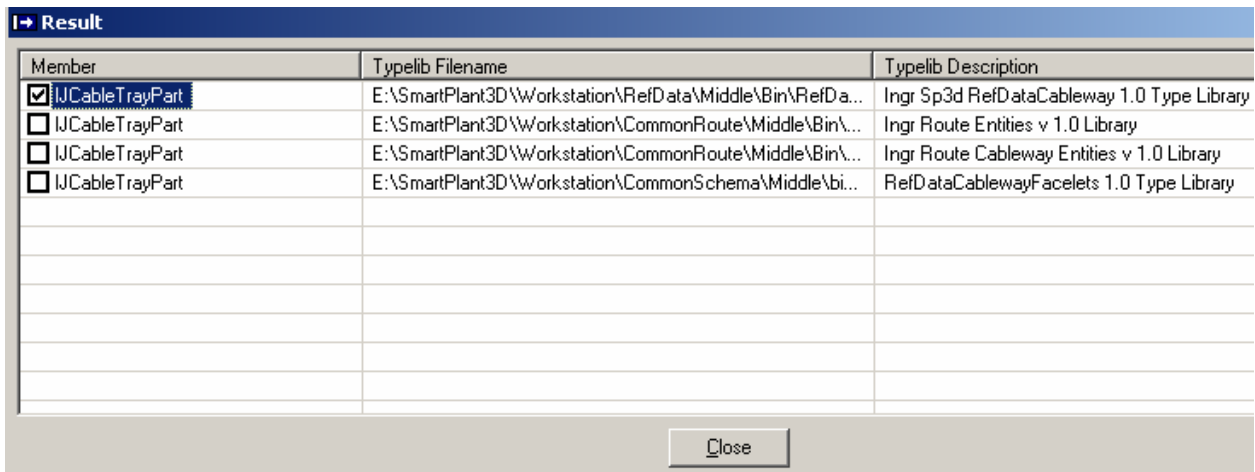
```

17. Select Project -> SP3D References

18. Use the SP3D reference tool to find the library that reference IJCabletrayPart



19. Select Ingr Sp3d RefDataCableway 1.0 Type Library. Select the Close button.



20. Compile the VB project and save the dll in the c:\train\bin

21. Save the VB SP3DFrameBox project.

22. Open the Cabletray2.xls workbook. Go to the Custom Interface sheet and edit/add the following entries:

Head	InterfaceName	CategoryName	AttributeName	AttributeUserName	Type	UnitsType	PrimaryUnits	CodeList	OnPropertyPage	ReadOnly	SymbolParameter
Start											
	IJUAFrameBox		FrameA	FrameA	Double	Distance	in		TRUE	FALSE	FrameA
			FrameB	FrameB	Double	Distance	in		TRUE	FALSE	FrameB
End											

22. Go the R-ClassNodeDescribes sheet and add the following entry.

Head	RelationSource	RelationDestination
Start		
	! End Plates	
	CableTrayEndPlates	FrameBoxConnector
End		

23. Create the FrameBoxConnector Part Class ass follows:

In the Definition Section:

Definition	PartClassType	SymbolDefinition	UserClassName	OccClassName
	CableTrayClass	SP3DFrameBox.CSP3DFrameBox	Cable Tray Box Connector	Cable Tray Box Connector

In the Part Section:

System attributes:

PartNumber	PartDescription	Common Key Inputs				Component Specific Inputs							
		Manufacturer	Material	Tray Type	ComponentType	Length	LoadSpanClassification	RungSpacing	TangentLength	BendAngle	BendRadius	MirrorBehaviorOption	ReplacementPartNumber
Frame Box connector-001	Frame Box connector-001	698	5	5	305		25	6in				5	

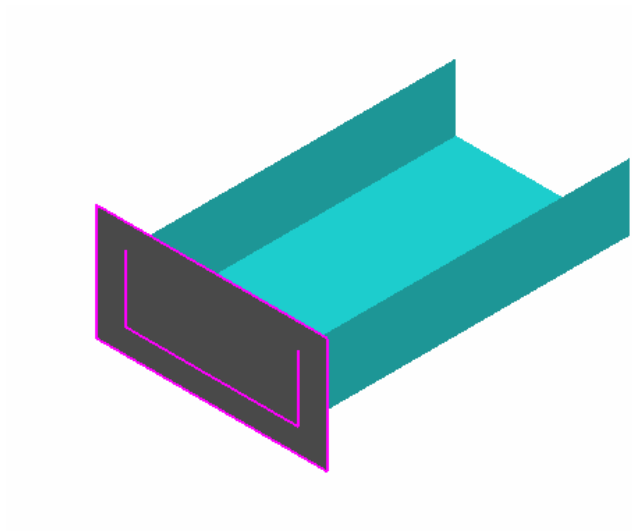
Port Information:

Port Data									
NominalWidth	NominalDepth	ReducingSize	SymbolDefinition	NominalWidth[1]	NominalDepth[1]	ActualWidth[1]	ActualDepth[1]	LoadWidth[1]	LoadDepth[1]
12in	4in			12in	4in	12in	4.63in	12in	4in

[illegible]

- Note: You just need to update the views in the model.

- 48



Box Connector - Symbol Modification

Modify the Frame Box connector symbol (SP3DFrameBox) by adding two plates and the hole.

1. Open the SP3DFrameBox.vb program and add the following entries in the output section:

```
' Outputs
m_oSymbolHelper.NumOutputs = 4
m_oSymbolHelper.AddOutputDef 1, "Body1", "Body1", 1
m_oSymbolHelper.AddOutputDef 2, "Body2", "Body2", 1
m_oSymbolHelper.AddOutputDef 3, "Body3", "Body3", 1
m_oSymbolHelper.AddOutputDef 4, "port", "port", 1
```

2. Go to CSimplePhysical Class module and add your code to create the hole:

```
'-----
' Create the hole boundaries
'-----

Dim parActualWidth As Double
Dim parActualDepth As Double

Call RetrieveCableTrayPortProperties(1, oPartFclt, parActualWidth, parActualDepth)

Dim thickness1 As Double
Dim thickness2 As Double
thickness1 = (parFrameB - parActualWidth) / 2
thickness2 = (parFrameA - parActualDepth) / 2

Dim STPoint As IJDPosition
Set STPoint = New DPosition
STPoint.Set 0, Points(1) - thickness1, Points(2) - thickness2
Dim lines As Collection
Dim oline As IngrGeom3D.Line3d

Set lines = New Collection
Set oline = geomFactory.Lines3d.CreateBy2Points(Nothing, _
0, Points(1) - thickness1, Points(2) - thickness2, _
0, Points(4) + thickness1, Points(5) - thickness2)
lines.Add oline

Set oline = geomFactory.Lines3d.CreateBy2Points(Nothing, _
0, Points(4) + thickness1, Points(5) - thickness2, _
0, Points(7) + thickness1, Points(8) + thickness2)
lines.Add oline

Set oline = geomFactory.Lines3d.CreateBy2Points(Nothing, _
0, Points(7) + thickness1, Points(8) + thickness2, _
0, Points(10) - thickness1, Points(11) + thickness2)
lines.Add oline

Set oline = geomFactory.Lines3d.CreateBy2Points(Nothing, _
0, Points(10) - thickness1, Points(11) + thickness2, _
0, Points(1) - thickness1, Points(2) - thickness2)
lines.Add oline
```

3. Use the Set statement to clear the references from all object variables.

4. Add your code to create the right plate using the PlaceBox() routine.

5. Add code to create the left plate using the PlaceBox() routine.

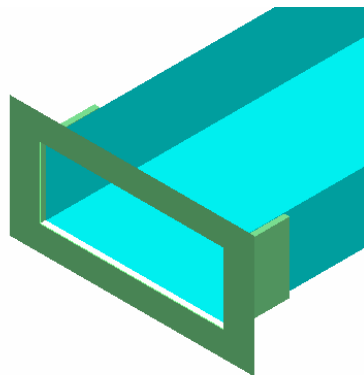
51

```
pPos2.Set 0, HW + 0.001, HD
Set ObjBody2 = PlaceBox(m_OutputColl, pPos1, pPos2)
iOutput = iOutput + 1
m_OutputColl.AddOutput arrayOfOutputs(iOutput), ObjBody2
```

6. Use the Set statement to clear the references from all object variables.

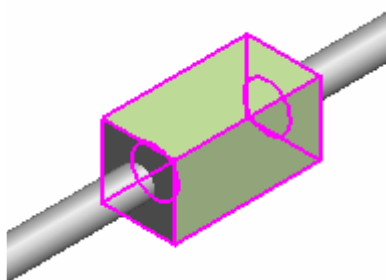
```
Set pPos1 = Nothing
Set pPos2 = Nothing
Set geomFactory = Nothing
Set ObjBody2 = Nothing
```

7. Go to Project->Properties to open the Project Properties Dialog box.
8. Go to the Make Tab and increase the major version number.
9. Compile the VB project and save the dll in c:\train\bin
10. Save the VB SP3DFrameBox project.
11. Open the Cabletray2.xls
12. Add the letter M on the Part Class Definition and on the Part.
13. Load the information into the Catalog using the Modify Mode. Once the bulkload process is complete, review the log file. Next, synchronize the model with the catalog databases..
14. Go to the Electrical Task and review the Frame Box connector.



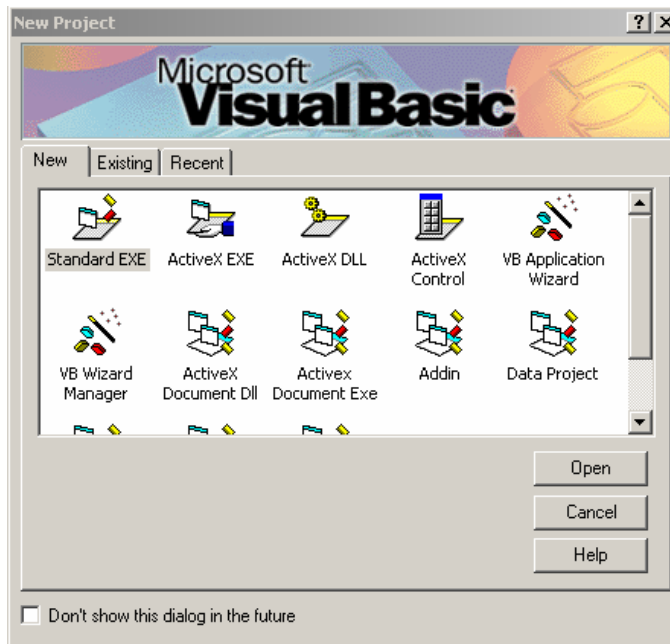
Junction Box Symbol

- Create a Junction Box using the SmartPlant 3D Part Definition VB Wizard

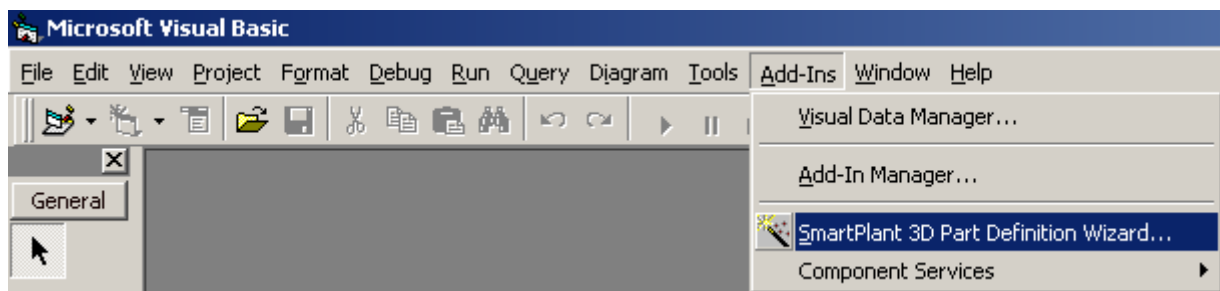


Skip the following lines if the symbol wizard is installed on your machine.

1. Go to [Install Directory]\Programming\Tools\SymbolWizard
2. Install SP3D VB Symbol Wizard in device c:\Program Files\ SP3D Symbol Wizard
3. Create Company Catalog Directories in device c:\train
c:\train\bin
c:\train\IngrModules
c:\train\CompanyModules
c:\train\ SP3DJunctionBox
4. Run Microsoft Visual Basic 6.0. Close the Microsoft New Project dialog box.



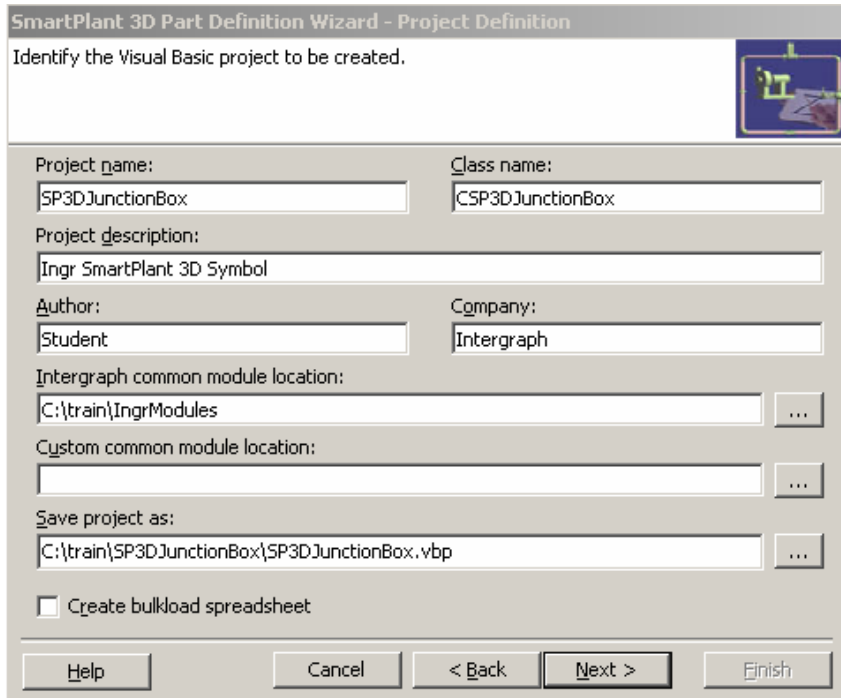
5. Go to the Add-Ins Option and Select SmartPlant 3D Part Definition Wizard.



6. Select Next button to skip the Introduction page. The Next step is to create the SP3DJunctionBox symbol definition template using SP3D part Definition VB Symbol Wizard.
7. In this page you define the VB project name. Key in the following information:

Project Name: SP3DJunctionBox

Author: Student
 Company: Intergraph
 Intergraph Module location: c:\Train\IngrModules
 Save the VB project as: c:\Train\ SP3DJunctionBox



SmartPlant 3D Part Definition Wizard - Project Definition

Identify the Visual Basic project to be created.

Project name: SP3DJunctionBox Class name: CSP3DJunctionBox

Project description: Ingr SmartPlant 3D Symbol

Author: Student Company: Intergraph

Intergraph common module location: C:\train\IngrModules

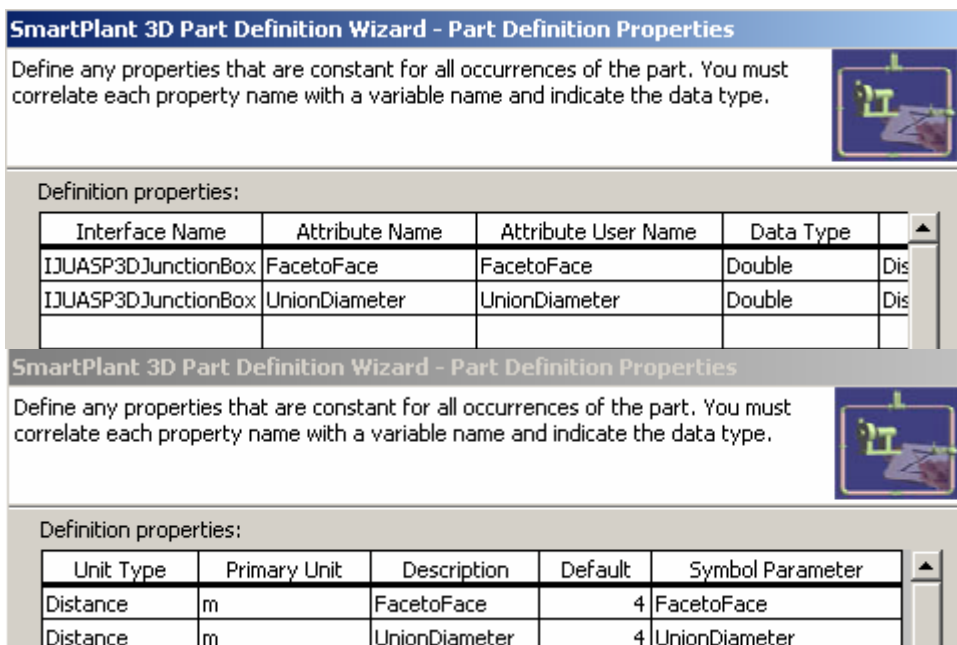
Custom common module location:

Save project as: C:\train\SP3DJunctionBox\SP3DJunctionBox.vbp

☐ Create bulkload spreadsheet

Help Cancel < Back Next > Finish

8. Select Next button to go the next page. This page is to define any input properties that are defined in the part class that are constant for all occurrences. We are going to define two attributes for our SP3DJunctionBox. Key in the following data:



SmartPlant 3D Part Definition Wizard - Part Definition Properties

Define any properties that are constant for all occurrences of the part. You must correlate each property name with a variable name and indicate the data type.

Definition properties:

Interface Name	Attribute Name	Attribute User Name	Data Type	
IJUASP3DJunctionBox	FacetoFace	FacetoFace	Double	Dis
IJUASP3DJunctionBox	UnionDiameter	UnionDiameter	Double	Dis

SmartPlant 3D Part Definition Wizard - Part Definition Properties

Define any properties that are constant for all occurrences of the part. You must correlate each property name with a variable name and indicate the data type.

Definition properties:

Unit Type	Primary Unit	Description	Default	Symbol Parameter
Distance	m	FacetoFace	4	FacetoFace
Distance	m	UnionDiameter	4	UnionDiameter

9. Select Next button to go the next page. Skip this page because our conduit part does not have occurrence attributes.

SmartPlant 3D Part Definition Wizard - Part Occurrence Properties

Define any properties that are different for each occurrence of the part. You must correlate each property name with a variable name and indicate the data type.

Occurrence properties:

Interface Name	Attribute Name	Attribute User Name	Data Type

Help Cancel < Back Next > Finish

10. Select Next button to go the next page. This page identifies all the outputs of the conduit part. We are going to define one output and two ports for our SP3DJunctionBox. The output is in the simple Physical aspect.

SmartPlant 3D Part Definition Wizard - Outputs

Identify any outputs on the part. In the Visual Basic project, you will need to write code to define the geometry and position of each of these outputs.

Nozzles: Nozzle type:

Outputs:

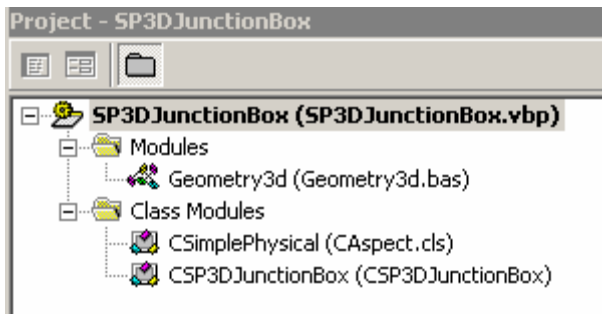
A	B	C
Name	Description	Type
Body1	Body1	Body

Aspects in which the selected output will be displayed:

- ☒ Simple physical
- ☐ Detailed physical
- ☐ Insulation
- ☐ Operation
- ☐ Maintenance

Help Cancel < Back Next > Finish

-
11. Hit Next button and Finish button to create the SP3DFrameBox project template. The VB project consists of the following modules:



12. Open the **CSP3DJunctionBox Class** module. This Class contains several routines.
13. Go to the Class_Initialize() routine in the input section. Review the inputs and add two outputs definition for the conduit ports as shown below.

```
Private Sub Class_Initialize()  
    Const METHOD = "Class_Initialize:"  
    On Error GoTo Errx  
  
    Set m_oSymbolHelper = New SymbolServices  
    m_oSymbolHelper.ProjectName = "SP3DJunctionBox"  
    m_oSymbolHelper.ClassName = "CSP3DJunctionBox"  
  
    ' Inputs  
    m_oSymbolHelper.NumInputs = 2  
    m_oSymbolHelper.AddInputDef 1, "FacetoFace", "FacetoFace", 4  
    m_oSymbolHelper.AddInputDef 2, "UnionDiameter", "UnionDiameter", 4  
  
    ' Outputs  
    m_oSymbolHelper.NumOutputs = 3  
    m_oSymbolHelper.AddOutputDef 1, "Body1", "Body1", 1  
    m_oSymbolHelper.AddOutputDef 2, "port1", "port1", 1  
    m_oSymbolHelper.AddOutputDef 3, "port2", "port2", 1  
  
    ' Aspects  
    m_oSymbolHelper.NumAspects = 1  
    m_oSymbolHelper.AddAspectDef 1, "SimplePhysical", "SimplePhysical", 1  
  
    Exit Sub  
Errx:  
    Err.Raise Err.Number, Err.Source & " " & METHOD, Err.Description, _  
        Err.HelpFile, Err.HelpContext  
End Sub
```

14. Go to **CSimplePhysical Class** module and add your code to create the outputs:
15. Go to the Insert your code for output 1 (Body1) section. The following code will use the PlaceBox() routine to create a Box for the Junction box. This function takes the two opposite corners of the box as input parameters.

```
Dim pPos1 As IJDPosition
```

```

Dim pPos2 As IJDPosition
Set pPos1 = New DPosition
Set pPos2 = New DPosition

pPos1.Set -parFacetoFace / 2, -parUnionDiameter / 2, -parUnionDiameter / 2
pPos2.Set parFacetoFace / 2, parUnionDiameter / 2, parUnionDiameter / 2

Set ObjBody1 = PlaceBox(m_OutputColl, pPos1, pPos2)

iOutput = iOutput + 1
m_OutputColl.AddOutput arrayOfOutputs(iOutput), ObjBody1

```

16. The following code will use the CreateConduitNozzle() method to create the conduit ports. The CreateConduitNozzle() routine is located in the Geometry3d module.

```

' Place Nozzle 1

Dim pipeDiam As Double
Dim flangeThick As Double
Dim sptOffset As Double
Dim flangeDiam As Double
Dim depth As Double
Dim ConduitOD As Double

RetrieveParameters 1, oPartFclt, m_OutputColl, ConduitOD, flangeThick, flangeDiam, sptOffset, depth

Dim oPlacePoint As AutoMath.DPosition
Dim oDir As AutoMath.DVector
Dim objNozzle As GSCADNozzleEntities.IJConduitPortOcc
Dim faceToFace As Double

Set oPlacePoint = New AutoMath.DPosition
Set oDir = New AutoMath.DVector
faceToFace = arrayOfInputs(2)
oPlacePoint.Set -faceToFace / 2 - sptOffset + depth, 0, 0
oDir.Set -1, 0, 0
Set oPartFclt = arrayOfInputs(1)
Set objNozzle = CreateConduitNozzle(oPlacePoint, oDir, m_OutputColl, oPartFclt, 1)
' Set the output
iOutput = iOutput + 1
m_OutputColl.AddOutput arrayOfOutputs(iOutput), objNozzle
Set objNozzle = Nothing

' Place Nozzle 2
RetrieveParameters 2, oPartFclt, m_OutputColl, ConduitOD, flangeThick, flangeDiam, sptOffset, depth
oPlacePoint.Set faceToFace / 2 + sptOffset - depth, 0, 0
oDir.Set 1, 0, 0
Set objNozzle = CreateConduitNozzle(oPlacePoint, oDir, m_OutputColl, oPartFclt, 2)
' Set the output
iOutput = iOutput + 1
m_OutputColl.AddOutput arrayOfOutputs(iOutput), objNozzle

```

17. Use the Set statement to clear the references from all object variables.

```

Set objNozzle = Nothing
Set oPlacePoint = Nothing

```

Set oDir = Nothing

18. Compile the VB project and save the dll in c:\train\bin
19. Save the VB SP3DJunctionBox project.
20. Open the RMC.xls workbook. Create the Junction Box Part Class (ConduitJunctionBox sheet) as follows:

In the Definition Section:

Definition	PartClassType	SymbolDefinition	UserClassName	OccClassName
	ConduitComponentClass	SP3DJunctionBox.CSP3DJunctionBox	Conduit Junction Box	Conduit Junction Box

In the Part Section:

System attributes:

Head	IndustryCommodityCode	CommodityType	GraphicalRepresentationOrNot	SymbolDefinition	MaterialGrade	LiningMaterial
Start						
a	RMC000004	Conduit JB			1780	
a	RMC000004	Conduit JB			1780	
a	RMC000004	Conduit JB			1780	

Port Information:

PipingPointBasis[1]	Id[1]	PressureRating[1]	EndPreparation[1]	EndStandard[1]	ScheduleThickness[1]	FlowDirection[1]	PipingPointBasis[2]	Id[2]	PressureRating[2]	EndPreparation[2]	EndStandard[2]	ScheduleThickness[2]	FlowDirection[2]
130		441	987	0.84"			130		441	987	0.84"		
130		441	987	1.315"			130		441	987	1.315"		
130		441	987	2.375"			130		441	987	2.375"		

Dimensions

Npd[1]:Primary	NpdUnitType[1]	Npd[2]:Secondary	NpdUnitType[2]	FacetoFace	UnionDiameter
0.5	in	0.5	in	4in	2in
1	in	1	in	6in	3in
2	in	2	in	8in	4in

Conduit Filter Records

21. Go to the ConduitFilter sheet.
22. Add record for the junction box as shown below:

Head	SpecName	ShortCode	Comments	FirstSizeFrom	FirstSizeTo	FirstSizeUnits	SecondSizeFrom	SecondSizeTo	SecondSizeUnits	CommodityOption	ContractorCommodityCode	BendRadius	BendRadiusMultiplier	SelectionBasis
Start														
	RMC	Conduit	Straight Conduit	0.5	2	in				1	RMC000001			1
		Conduit Bend	Conduit Bend	0.5	2	in				1	RMC000001		5	5
		45 Degree Elbow	45 Degree Elbow	0.5	2	in				1	RMC000001		5	5
		90 Degree Elbow	90 Degree Elbow	0.5	2	in				1	RMC000001		5	5
		Coupling	Coupling	0.5	2	in				1	RMC000002			1
a		Junction Box	Junction Box	0.5	2	in				1	RMC000004			1

ConduitCommodityMatlControlData Data

23. Go to the ConduitCommodityMatlControlData sheet.

24. Add record for the junction box as shown below:

Head	ContractorCommodityCode	FirstSizeFrom	FirstSizeTo	FirstSizeUnits	SecondSizeFrom	SecondSizeTo	SecondSizeUnits	MultisizeOption	IndustryCommodityCode	ClientCommodityCode	ShortMaterialDescription	LocalizedShortMaterialDesc	LongMaterialDescription	Vendor	Manufacturer	FabricationType	SupplyResponsibility	ReportingType	QuantityOfReportableParts	GasketRequirements	BoltingRequirements
Start																					
!	1.9.1	1.9.2	1.9.3	N/A	1.9.4	1.9.5	N/A	1.9.6	1.9.7	1.9.8	1.9.10	1.9.11	1.9.12	1.9.15	1.9.16	1.9.18	1.9.20	1.9.21	1.9.23	1.9.24	1.9.25
	RMC000001								RMC000001		Tube, PE, Aluminum					7				20	35
	RMC000002								RMC000002		Conduit Coupling					7				20	35
a	RMC000004								RMC000004		Junction Box					7				20	35

ShortCodeHierarchyRule Data

25. Create a sheet called ShortCodeHierarchyRule and add the appropriate records as shown below:

Head	ShortCodeHierarchyType	ShortCode
Start		
	Other Inline Fittings	Junction Box
End		

26. Save the workbook.
27. Open the AllCodeList.xls. Go to the PipingCommodityType sheet.
28. Add record for the new Conduit Commodity Type as shown below:

HEAD	PipingCommodityClass ShortDescription	PipingCommodity Class LongDescription	PipingCommoditySubClass ShortDescription	PipingCommodityType ShortDescription	PipingCommodityType LongDescription	Codelist Number	Sort Order
	Conduit					300	
			Conduit			1000	
				Conduit	Straight conduit	7000	
	Conduit In-Line fittings					305	
			Conduit Couplings			1005	
				Conduit CPL	Full Coupling	7050	
				Conduit CPLR	Reducing Coupling	7055	
a				Conduit JB	Conduit Junction Box	107056	
			Conduit Unions			1010	

29. Save the workbook.
30. Select Start => Programs => Intergraph SmartPlant3D => Database Tools => Bulkload Reference Data.
31. Select the “Add” option under “Excel Files” and select RMC.xls
32. Select the “Add” option under “Excel Codelist Files” and select Allcodelist.xls
33. Select an existing catalog.
34. Load the records into the database using the “Append” mode.
35. Once the bulkload process is complete, review the log file. Next, synchronize the model with the catalog databases. Finally, Re-generate the report databases.
36. Go to the Electrical Task and place the Junction Box.

