Business To Manufacturing Markup Language

B2MML –Process Segment

Version 0500 – March 2011

Process Segment Schema Documentation

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Change History:

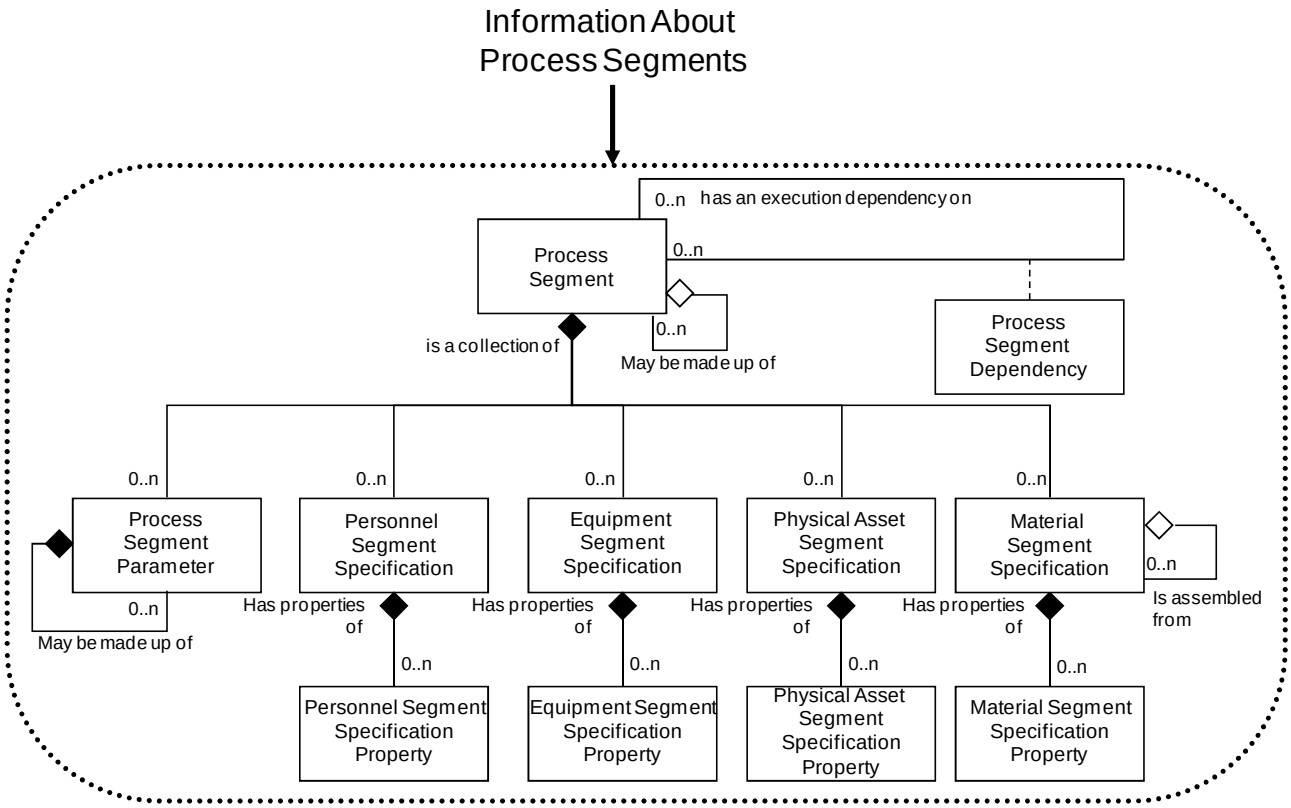
Change	Date	Person	Description
V01	7 April 2002	Dennis Brandl Dave Emerson	Initial release
V02	23 Sept 2003	Dennis Brandl Dave Emerson	• Changed ##any to "Any" element of type "AnyType"
V03	26 Aug 2005	Dennis Brandl Dave Emerson	• Added substitution groups. One group added just before each Any element.
V0301	29 Dec 2005	Dennis Brandl	• Made “Value” elements 0..unbounded
V04	04 June 2007	Dennis Brandl	• Added transaction elements • Removed choice elements in Equipment, Material, and Personnel segment specification types.
V0401	Oct 2008	Dennis Brandl	• Changed version number
V0500	Mar 2011	Dennis Brandl	• Updated for ISA 95.02-2010 • Added Physical Asset elements • Added material assembly elements • Removed ##any elements

1 Schema Scope

This document defines the information about process segment definitions that may be exchanged between business systems and manufacturing operations systems. This information is based on the data models and attributes defined in the ANSI/ISA 95.00.02 Enterprise/Control System Integration standard. Contact ISA (The Instrumentation, System, and Automation Society) for copies of the standard. Additional information on the standard is available at www.isa.org.

1.1 Key Information Assumptions

The data represented in these schemas is derived from the UML model below. This model is defined in the ANSI/ISA 95.00.02 standard. The information model in the model below is hierarchical with process segments containing process segments and personnel, equipment, and material specification information. The key assumption is that the information will be accessed by process segment.



Model of Exchanged Process Segment Information

This schema uses a common schema for definition of elements that are used in multiple schemas, such as ID, Description, and Value. See the document defining the Common schema for definition of the common elements.

1.2 Key Use Assumptions

The model only defines the exchanged information and does not define the use of the information or encapsulation of the information in any defining transactions.

1.3 ProcessSegmentInformation

The main structuring element of the schema definition is ProcessSegmentInformation.

1.4 ProcessSegment

A process segment is a logical grouping of personnel resources, equipment resources, and material required to carry out a production step. Process segment usually define the needed classes of personnel, equipment, and material, but it may define specific resources, such as specific equipment needed. Process segment usually define the quantity of the resource needed.

Identifying process segments requires an understanding of the business processes within the company and the general structure of the manufacturing processes. Not all process segments need to relate to production, there are at least three general types of process segments:

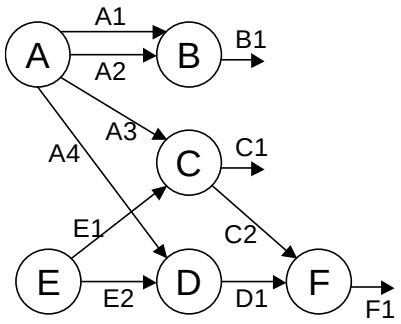
- Production segments – those relating to conversion of raw or intermediate materials into intermediate materials or final products.
- Movement segments – those relating to movement of materials and keeping track of material and product locations.
- Inspection segments – those relating to confirming or testing quality and suitability of materials and products.

ProcessSegment elements may be used to contain information about defined process segments, and the personnel, equipment, and materials required for the segment.

Process segments may also contain process segments, for example a product assembly segment may be made up of assembly, test, and packaging segments. Each segment may be defined as a separate element with separate specifications

Routing may be dependent on the processes. In the figure below the routing contains material dependencies information. The routing information is then used for scheduling. The route in the left side of the figure can be represented in a set of process segment definitions (center table in figure) and process segment dependency definitions (right table in figure). The process segment definitions contain the material production and consumption information. The consumption and production information within the process segments define additional constraints and dependencies required for scheduling of material B1, C1, and F1.

Routings and Material Dependencies



Process Segment

Process Segment A
- produces material A1
- produces material A2
- produces material A3
- produces material A4

Process Segment B
- consumes material A1
- consumes material A2
- produces material B1

Process Segment C
- consumes material A3
- consumes material E1
- produces material C1
- produces material C2

Process Segment D
- consumes material A4
- consumes material E2
- produces material D1

Process Segment E
- produces material E1
- produces material E2

Process Segment F
- consumes material C2
- consumes material D1
- produced material F1

Process Segment Dependencies

B must follow A
C must follow A
C must follow E
D must follow A
F must follow C
F must follow D

Routing with co-products and material dependencies

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1.4.1 PersonnelSegmentSpecification

PersonnelSegmentSpecification information may be used to contain information about personnel resources required for execution of the process segment. An element defines the quantity of the personnel class or person required, or a list of properties that identify the subset of the class and quantity of the subset required.

1.4.2 EquipmentSegmentSpecification

EquipmentSegmentSpecification information may be used to contain information about equipment resources required for execution of the process segment. An element defines the quantity of the equipment class or equipment required, or a list of properties that identify the subset of the class and quantity of the subset required.

1.4.3 PhysicalAssetSegmentSpecification

PhysicalAssetSegmentSpecification information may be used to contain information about physical asset resources required for execution of the process segment. An element defines the quantity of the physical asset class or physical asset required, or a list of properties that identify the subset of the class and quantity of the subset required.

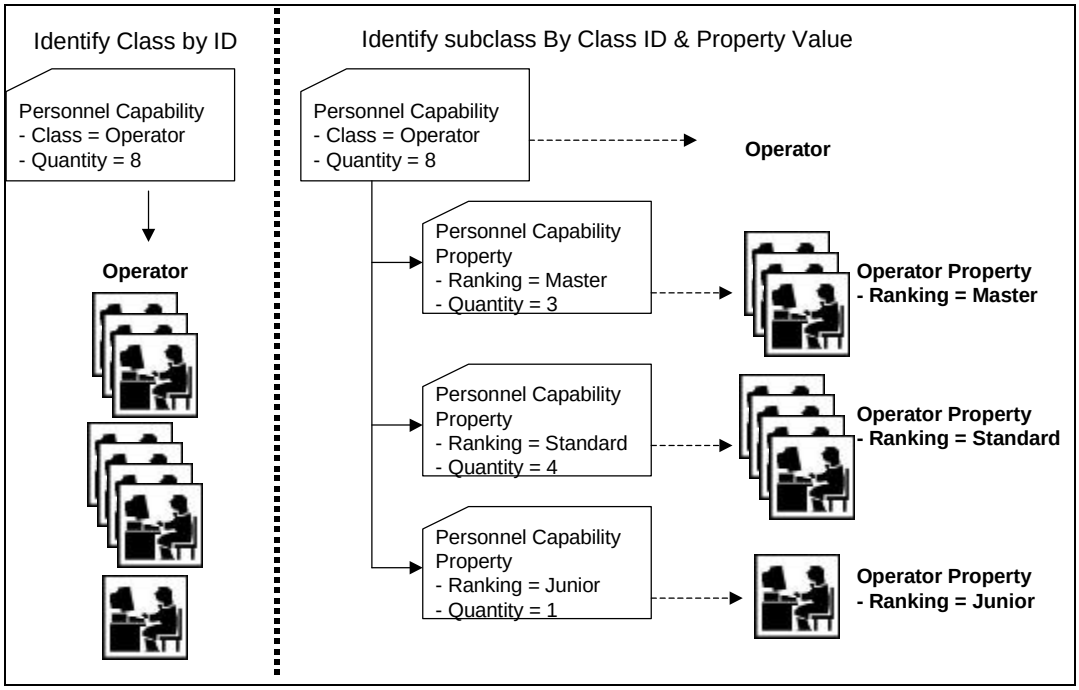
1.4.4 MaterialSegmentSpecification

MaterialSegmentSpecification information may be used to contain information about material resources required for execution of the process segment. An element defines the quantity of the material class or material definition required, or a list of properties that identify the subset of the class and quantity of the subset required.

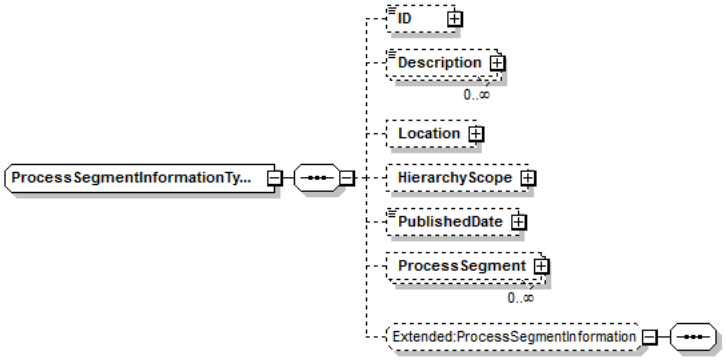
1.5 Resource Identification

The process segment information defines what resources are required for execution of the process segment. It does this by defining the classes of resources, or in some cases the exact instance of a resource required. For example, an inspection segment may require 1 inspector for 2 hours, and 1 inspection machine for 2 hours. In some industries the exact inspection machine may have to be specified, such as "ElectonMicroprobe#1".

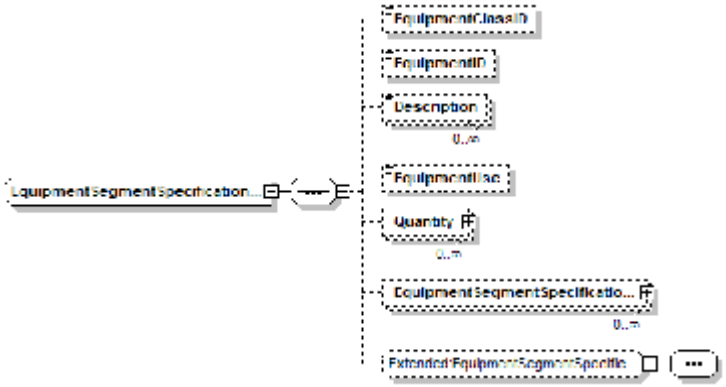
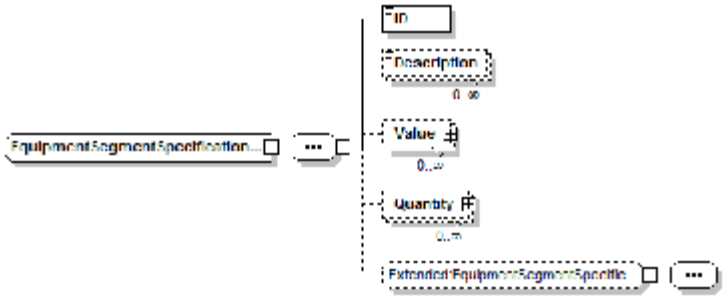
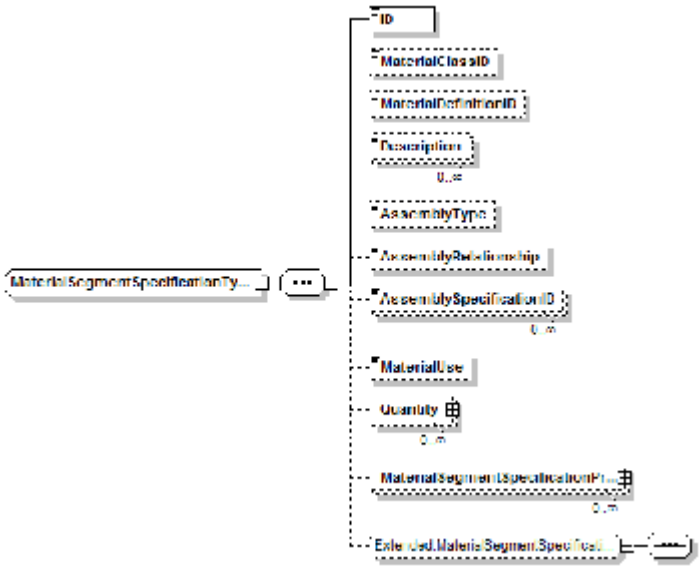
The schemas follow the ANSI/ISA-95 standard by defining resources by class or instance ID, or by defining them by class ID and a property value that is used to define a subset of the resource. For example, the figure below illustrates that a segment may require a certain number of "operators", a personnel class. Other segments may require a subset of operators, such as "Master" operators only. In the first case the class name, "Operator", is sufficient to identify the resource required. In the second case the class name, "Operator", and property name and value, "Ranking" and "Master", define the required resource.

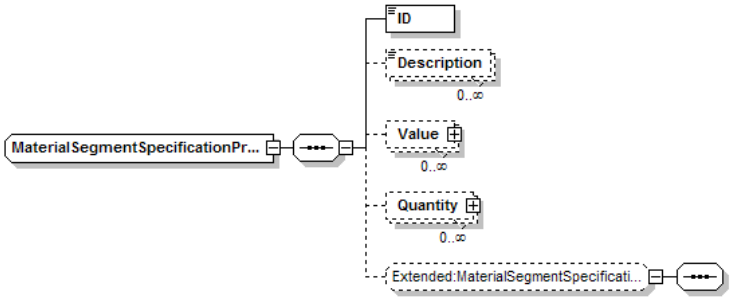
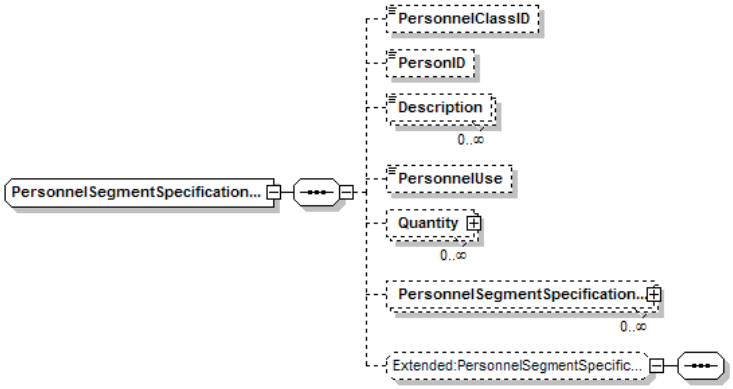
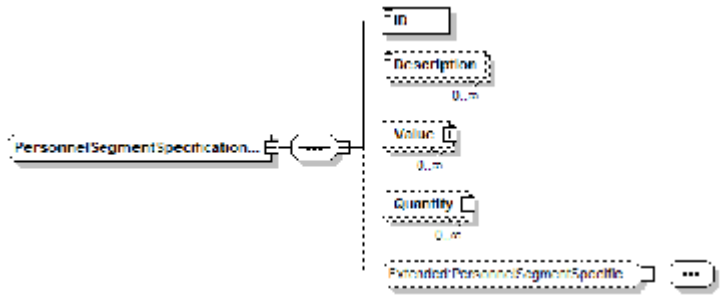


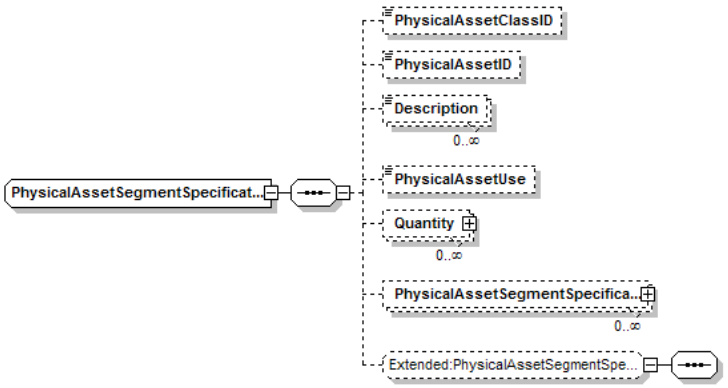
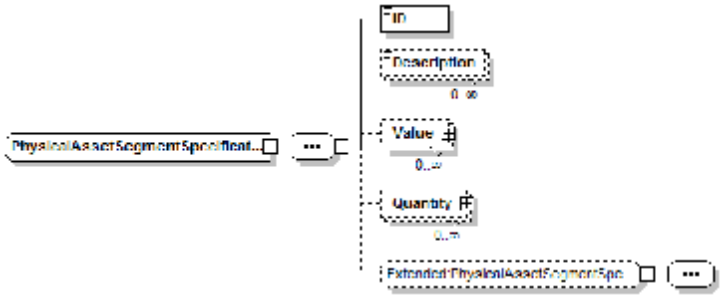
2 Element Definitions

Element/Type	Description
ProcessSegmentInformation ***ProcessSegmentInformationType***	Contains a list of process segments, includes the location of the scope of the information, and the date of publication of the information. May also contain application specific extended elements. 

Element/Type	Description
ProcessSegment ***ProcessSegmentType***	Contains a definition of a process segment, including the location of the scope the definition, the date of publication, the segment dependencies, encapsulated segments, parameters associated with the segment, and the material, personnel, and equipment resources required for the segment. May also be a top level element. This may also contain application specific extended elements. 

Element/Type	Description
EquipmentSegmentSpecification ***EquipmentSegmentSpecificationType***	Contains a specification of an equipment resource required for a process segment, the quantity of the resource, and a definition of the class or equipment and property. May also contain application specific extension elements. 
EquipmentSegmentSpecificationProperty ***EquipmentSegmentSpecificationPropertyType***	Contains a specification of a quantity required for an equipment property that is identified by value. 
MaterialSegmentSpecification ***MaterialSegmentSpecificationType***	Contains a specification of a material resource required for a process segment, the quantity of the resource, and a definition of the class or definition and property. May also contain application specific extension elements. 

Element/Type	Description
MaterialSegmentSpecificationProperty ***MaterialSegmentSpecificationPropertyType***	Contains a specification of a quantity required for a material property that is identified by value. 
PersonnelSegmentSpecification ***PersonnelSegmentSpecificationType***	Contains a specification of a personnel resource required for a process segment, the quantity of the resource, and a definition of the class or person and property. May also contain application specific extension elements. 
PersonnelSegmentSpecificationProperty ***PersonnelSegmentSpecificationPropertyType***	Contains a specification of a quantity required for a personnel property that is identified by value. 

Element/Type	Description
PhysicalAssetSegmentSpecification ***PhysicalAssetSegmentSpecificationType***	process segment, the quantity of the resource, and a definition of the class or person and property. May also contain application specific extension elements. 
PhysicalAssetSegmentSpecificationProperty ***PhysicalAssetSegmentSpecificationPropertyType***	Contains a specification of a quantity required for a personnel property that is identified by value. 

3 Transaction Elements

The following elements are defined to support the ISA 95 Part 5 transactions, using the transaction data types defined in the B2MML-Common.xsd schema.

Process Segment Information Elements	Description
GetProcessSegmentInformation	Get *ProcessSegment* definitions.
ShowProcessSegmentInformation	Returned information from the *GetProcessSegmentInformation* message.
ProcessProcessSegmentInformation	Process *ProcessSegment* definitions.
AcknowledgeProcessSegmentInformation	Returned status from the *ProcessProcessSegmentInformation* message.
ChangeProcessSegmentInformation	Change *ProcessSegment* definitions.
RespondProcessSegmentInformation	Returned status from the *ChangeProcessSegmentInformation* message.
CancelProcessSegmentInformation	Cancel *ProcessSegment* definitions.
SyncProcessSegmentInformation	Published *ProcessSegment* definitions.

Process Segment Elements	Description
GetProcessSegment	Get a *ProcessSegment* definition.
ShowProcessSegment	Returned information from the *GetProcessSegment* message.
ProcessProcessSegment	Process a *ProcessSegment* definition.
AcknowledgeProcessSegment	Returned status from the *ProcessProcessSegment* message.
ChangeProcessSegment	Change a *ProcessSegment* definition.
RespondProcessSegment	Returned status from the *ChangeProcessSegment* message.
CancelProcessSegmentI	Cancel a *ProcessSegment* definition.
SyncProcessSegment	Published *ProcessSegment* definition.

4 Diagram Convention

The schema diagrams using the following convention to illustrate the structure of the schema elements, the type of the elements and attributes, and the rules for optional elements and repetition.