

ANSI/ISA–95.00.04 – Update WD01

Enterprise-Control System Integration

Part 4: Objects and attributes for manufacturing operations management integration

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ISA–95.00.02–xxxx

Enterprise-Control System Integration Part 1: Models and Terminology

ISBN: xxx.xxx.xxxx

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ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 4: Object model attributes for manufacturing operations management integration

FOREWORD

This standard is Part 4 of a multi-part set of standards that defines the interfaces between enterprise activities and control activities. It follows ANSI/ISA-95.00.01-2000, Enterprise-Control System Integration Part 1: Models and Terminology.

The scope of this Part 4 standard is limited to defining the details of the interface content within manufacturing operations management. The scope of this Part 4 standard is limited to the definition of object models and attributes for the information defined in Part 3. The goal is to reduce the effort, cost, and errors associated with implementing these interfaces.

The standard may be used to reduce the effort associated with implementing new product offerings. The goal is to have enterprise systems and control systems that interoperate and easily integrate.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2. Therefore, the first three clauses present the scope of the standard, normative references, and definitions, in that order.

Clause 4 is normative. The intent is to describe the object models and attributes associated with the information defined in Part 1.

Clause 5 is normative. It defines completeness, conformance and compliance criteria associated with the objects defined in Part 1 and the attributes defined in Part 2.

Annex A is informative. It provides ...

Annex B is informative. It illustrates ...

Annex C is informative. It ...

INTRODUCTION

This Part 4 standard further defines the object models and attributes involved in data exchange between the categories and activities defined in ANSI/ISA-95.00.03, Enterprise- Control System Integration Part 3: Models of Manufacturing Operations Management (hereafter referred to as Part 3). The models and terminology defined in Part 3 and Part 4

- a) emphasize good manufacturing operations management integration practices during the entire life cycle of the systems;
- b) can be used to improve existing integration capability of manufacturing operations management systems; and
- c) can be applied regardless of the degree of automation.

Specifically, the Part 3 and Part 4 standards provide a standard terminology and a consistent set of concepts and models for integrating manufacturing operations management systems that will improve communications between all parties involved. Benefits produced will

- a) reduce the user's time to reach full production levels for new products;
- b) enable vendors to supply appropriate tools for implementing integration of manufacturing operations management systems;
- c) enable users to better identify their needs;
- d) reduce the cost of automating manufacturing processes;
- e) optimize supply chains; and
- f) reduce life-cycle engineering efforts.

The Part 3 and Part 4 standards may be used to reduce the effort associated with implementing new product offerings. The goal is to have manufacturing operations management systems that interoperate and easily integrate.

It is not the intent of the standards to

- a) suggest that there is only one way of implementing integration of manufacturing operations management systems;
- b) force users to abandon their current way of handling integration; or
- c) restrict development in the area of integration of manufacturing operations management systems.

ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 4: Object and attributes for manufacturing operations management integration

1 Scope

This part of ISA 95, in conjunction with ISA 95.00.03, Enterprise-Control System Integration–Part 3: Models of Manufacturing Operations Management, specifies interface content between manufacturing operations management categories and activities. The interfaces considered are the interfaces across and within Level 3 categories of the hierarchical model defined in Part 1. The goal is to reduce the risk, cost, and errors associated with implementing these interfaces.

The scope of Part 4 is limited to the definition of object models and attributes of the Part 3 exchanged information.

This Part 4 standard does not define attributes to represent the object relationships.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/ISA-95.00.01-2000, Enterprise-Control System Integration Part 1: Models and Terminology

ANSI/ISA-88.01-1995, Batch Control Part 1: Models and Terminology

ANSI/ISA-88.04-2006, Batch Control Part 4: Batch Production Records

IEC 62264-1, Enterprise-Control System Integration – Part 1: Models and Terminology

IEC 61512-1:1997, Batch control – Part 1: Models and terminology

ISO 19439:2003, Computer Integrated Manufacturing (CIM); Systems Architecture; Framework for Enterprise Modeling

ISO DIS 19440, Advanced Manufacturing Technology; Systems Architecture; Constructs for Enterprise Modeling

ISO 15704:2000, Industrial Automation Systems--Requirements for Enterprise-Reference Architectures and Methodologies

ISO/IEC 19501-1, Information Technology—Unified Modeling Language (UML)—Part 1:Specification

ISO 10303-1:1994, Industrial Automation Systems and Integration – Product data representation and exchange – Part 1: Overview and fundamental principles

ISO 15531-1:2003(E), Industrial Automation Systems and Integration – Industrial manufacturing management data– Part 1: General overview

3 Terms and definitions

For the purpose of this part the definitions given in IEC 62264-1 and the following apply.

3.1

4 Work models for manufacturing operations

4.1 Set of work models

A set of work models are used to represent the information exchanged between manufacturing operations management categories and activities. This is illustrated in Figure 1. This part defines information which can be exchanged between level 3 activities within an operations category or across operational categories.

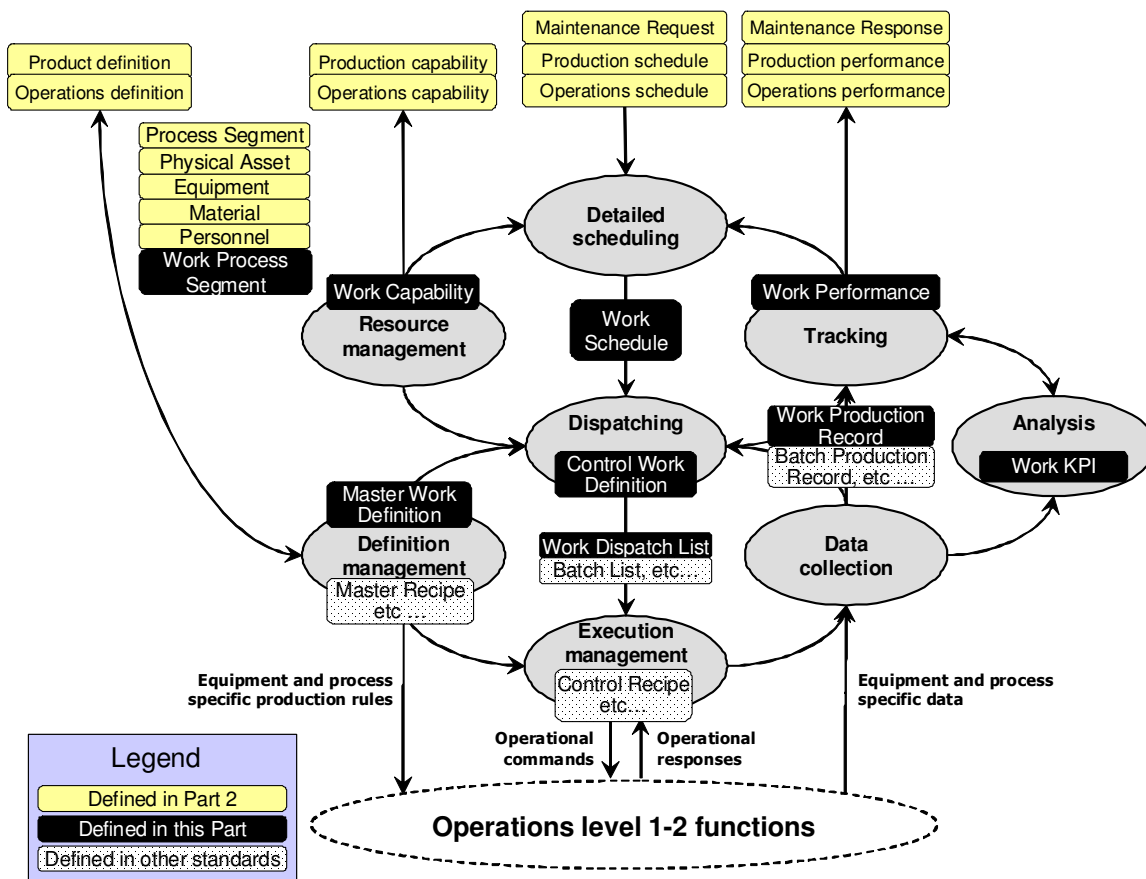


Figure 1 – Work information models for operations management

Part 2 defines objects that may be exchanged between Level 4 activities and Level 3 activities.

The ANSI/ISA 88 and IEC 61512 standards define object models that relate to the lower elements of the Level 3 activities and define the information used to create and manage Master Recipes, Control Recipes, Batch Lists, and Batch Production Records. Equivalent structures, or the IEC 61512 structures, could be used for other types of production. This part does not redefine these objects.

4.2 Work models

4.2.1 Level 3 vs level 4 models

The work models define structures that can be used to define, manage, and execute work within Level 3. The models follow the structure defined in Part 2 but are specifically defined for Level 3 activities. The Part 2 models define the view of manufacturing as seen by Level 4 business systems and based on a view of the manufacturing processes defined in *Process Segments*. This Part's models define the view of manufacturing as seen by Level 3 operations and are based on a view of the manufacturing processes defined in *Work Process Segments*.

Work process segments are the smallest elements of manufacturing activities that are visible to manufacturing operations management processes. They correspond to the detailed elements of work that are scheduled, displayed, executed, and tracked by Level 3 activities.

4.2.2 Common resource definitions

The object models in this Part use the personnel, equipment, physical asset, and material information defined in Part 2 of this standard. When used with Level 3 work objects the personnel, equipment, physical asset, and material information should include information required for Level 3 activities in addition to the information required to be shared with Level 4 activities.

EXAMPLE 1 The personnel information required for Level 3 activities may include detailed experience and qualification levels that are not shared with a Level 4 personnel or training management system.

EXAMPLE 2 The material information maintained for Level 3 activities may include Sublot information which is not shared with Level 4 material management systems.

4.2.3 Level 3 object models

The following object models are defined in this Part.

1. Work Process Segment – The smallest element of manufacturing activities that is visible to manufacturing operations management processes and that corresponds to a detailed element of work that is scheduled, displayed, executed, and tracked by Level 3 activities.
2. Work Schedule – A detailed schedule that may define production, maintenance, inventory or quality operations activities, or any combination of the activities.
3. Work Performance – A report on the execution of production, maintenance, inventory or quality operations activities, or any combination of the activities
4. Work Capability – A report on the capabilities of production, maintenance, inventory or quality operations activities, or any combination of the activities
5. Master Work Definition – A definition of the resources and subactivities required to perform a work activity.
6. Control Work Definition – The resources and subactivities for a specific job. TBD
7. Work Dispatch List – TBD
8. Work KPI – TBD
9. Work Production Record – TBD

5 Object model attributes

5.1 Introduction

This clause describes the object models and attributes for information exchanged in enterprise-control system integration. The attributes are part of the definition of terms.

A minimum set of industry-independent information has been defined as attributes in this Part. However, values for all attributes may not be required depending on the actual usage of the models. If additional information, including industry- and application-specific information, is needed, it shall be represented as property objects. This solution increases the usability through the use of standard attributes, and allows flexibility and extensibility through the use of properties. This was done to make the standard as widely applicable as possible.

5.2 Attribute extensibility

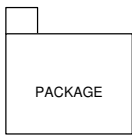
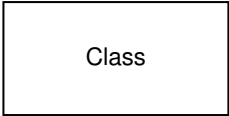
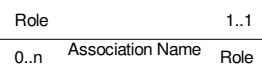
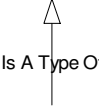
For particular applications the objects defined in the object models will need to be extended through the addition of attributes to object class definitions. Accordingly this Standard provides for attributes that are application or industry specific, to be modeled in terms of properties and represented in property classes in the model. For example, the personnel class property would be used to define application or industry specific attributes for personnel classes, and person property would be used to contain instance values for the properties.

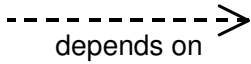
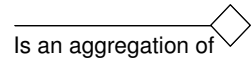
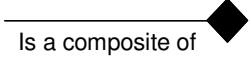
5.3 Object model structure

The object models are depicted using the Unified Modeling Language (UML) notational methodology, as defined in ISO/IEC 19501-1 Information Technology—Unified Modeling Language (UML)—Part 1:Specification.

Table 1 defines the UML notations used in the object diagrams.

Table 1 — UML notation used

Symbol	Definition
	Defines a package, a collection of object models, state models, use classes, and other UML models. In this document a package is used to specify an external model, such as a production rule model, or a reference to another part of the model.
	Defines a class of objects, each with the same types of attributes. Each object is uniquely identifiable or enumerable. No operations or methods are listed for the classes. Attributes with a “ - ” before their name indicate attributes that are generally optional in any use of the class.
	An association between elements of a class and elements of another or the same class. Each association is identified. May have the expected number or range of members of the subclass, when ‘n’ indicates an indeterminate number. For example, 0,n means that zero or more members of the subclass may exist.
	Generalization (arrow points to the super class) shows that an element of the class is a specialized type of the super class.

	Dependence is a weak association that shows that a modelling element depends on another modelling element. The item at the tail depends on the item at the head of the relationship.
	Aggregation (made up of) shows that an element of the class is made up of elements of other classes.
	Composite shows a strong form of aggregation, which requires that a part instance be included in at most one composite at a time and that the composite object has sole responsibility for disposition of its parts.

5.4 Explanation of tables

5.4.1 Tables of attributes

This subclause gives the meaning of the attribute tables. This includes a listing of the object identification, data types, and presentation of the examples in the tables.

5.4.2 Object identification

Many objects in the information model require unique identifications (IDs). These IDs shall be unique within the scope of the exchanged information. This may require translations:

- From the internal ID of the source system to the interface content ID
- From the interface content ID to the internal ID of the target system

EXAMPLE A unit may be identified as “X6777” in the interface content, as resource “R100011” in the business system, and as “East Side Reactor” in the control system.

A unique identification set shall be agreed to in order to exchange information.

The object IDs are used only to identify objects within related exchanged information sets. The object ID attributes are not global object IDs or database index attributes.

Generally, objects that are elements of aggregations, and are not referenced elsewhere in the model, do not require unique IDs.

5.4.3 Data types

The attributes presented are abstract representations, without any specific data type specified. A specific implementation will show how the information is represented.

EXAMPLE 1 An attribute may be represented as a string in one implementation and as a numeric value in another implementation.

EXAMPLE 2 A date/time value may be represented in ISO standard format in one implementation and in Julian calendar format in another.

EXAMPLE 3 A relationship may be represented by two fields (type and key) in data base tables or by a specific tag in XML.

5.4.4 Presentation of examples

Examples are included with each attribute given. Examples are presented for each of the main operations categories defined in Part 3 of this standard. See Table 2 below for how the example rows and columns are used.

Table 2 — Example table

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
Name of first attribute	Description of first attribute	Production Example	Maintenance Example	Quality Example	Inventory Example
Name of second attribute	Description of second attribute	Production Example	Maintenance Example	Quality Example	Inventory Example
Name of third attribute	Description of third attribute	Production Example	Maintenance Example	Quality Example	Inventory Example

When an example value is a set of values, or a member of a set of values, the set of values is given within a set of braces, {}.

The examples are purely fictional. They are provided to further describe attributes in the model. No attempt was made to make the examples complete or representative of any manufacturing enterprise.

5.4.5 Data relationships

The models used to document a reference to a resource, in another package, using the class or instance, with additional optional specification using properties, are not fully illustrated in the Part 1 object model figures. This relationship is not conformant to the Unified Modeling Language (UML) modeling methodology, but was done to keep the diagrams simpler. Figure 2 below illustrates how it is currently presented, on the left side, and how it could be more accurately modeled in UML on the right side. UML was used in this standard as a visualization method and not meant to describe implementations. The simplified relationship diagram method is used for the following objects and their relationship to another package:

Personnel Work Capability	Equipment Work Capability
Material Work Capability	Personnel Segment Capability
Equipment Segment Capability	Material Segment Capability
Personnel Segment Specification	Equipment Segment Specification
Material Segment Specification	Personnel Specification
Equipment Specification	Material Specification
Personnel Requirement	Equipment Requirement
Material Requirement	Personnel Actual
Equipment Actual	Material Actual

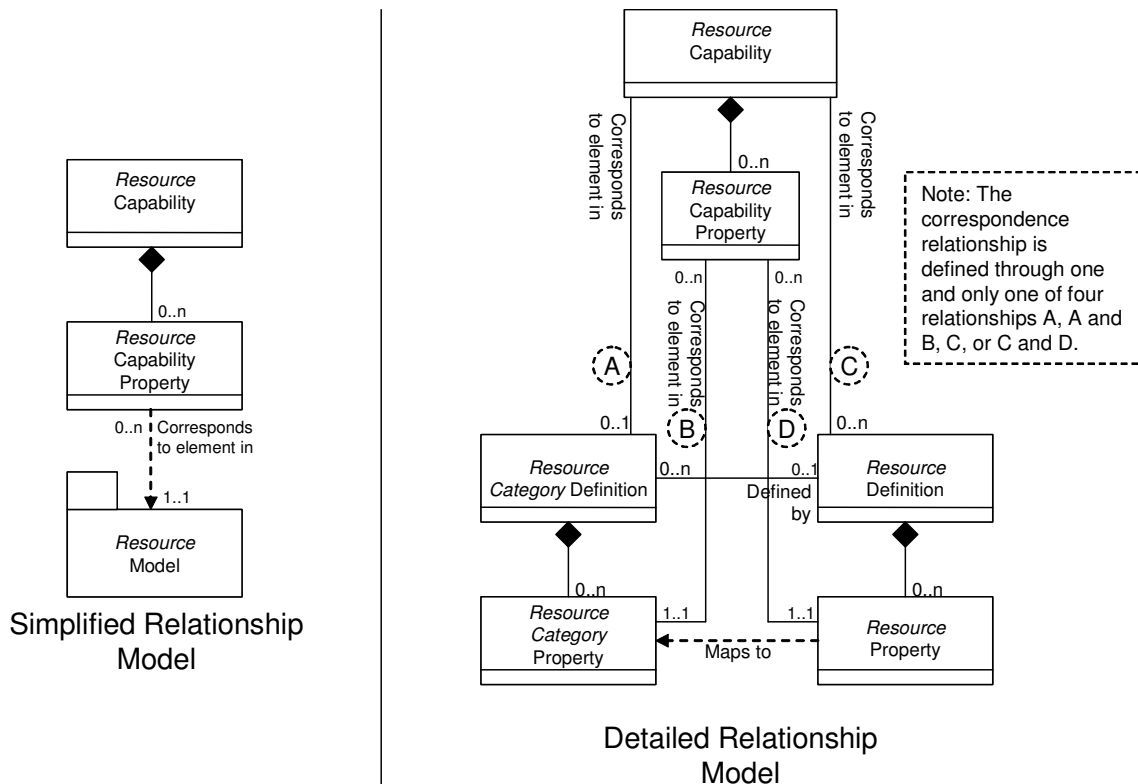


Figure 2 — Detailed relationship models

The correspondence relationship is determined through one and only one of four possible relationships: to the *resource category definition*; to the *resource category definition* and *resource category property*; to the *resource definition*; or to the *resource definition* and *resource property*.

In the model above the term *resource category* indicates: personnel class, equipment class, material class, and material definitions. The term *resource* indicates: person, equipment, material lot, and material subplot. The term *resource capability* indicates the use in the capability model, the process segment capability model, the process segment model, the product definition model, the production schedule model, and the production performance model.

6 Work process segment information

6.1 Work Process Segment Model

Work process segments are the smallest elements of manufacturing activities that are used by Level 3 manufacturing operations management detailed scheduling, dispatching, execution, and tracking processes. The work process segment model is a hierarchical model, in which multiple levels of abstraction of manufacturing processes may be defined.

Work process segments are also logical grouping of personnel resources, equipment resources, and material required to carry out a manufacturing operations step. A work process segment defines the needed classes of personnel, equipment, and material, and/or it may define specific resources, such as specific equipment needed. A work process segment may define the quantity of the resource needed.

The manufacturing operations step may be a production operations step, inventory operations step, maintenance operations step, and quality operations step.

Figure 3 is the work process segment model.

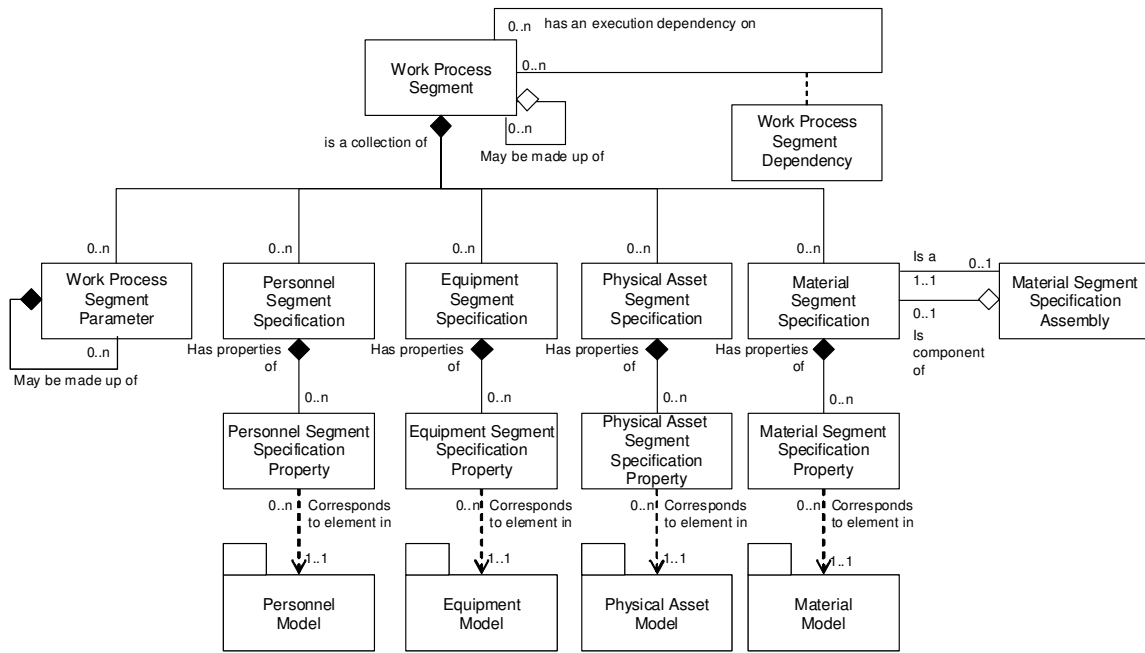


Figure 3 — Work process segment model

6.2 Work process segment attributes

A work process segment lists the classes of personnel, equipment, and material needed, and/or it may present specific resources, such as specific equipment needed for the work process segment. A work process segment may list the quantity of the resource needed.

A work process segment is something that occurs or can occur during manufacturing operations.

Work process segment may identify

- a) the time duration associated with the resource;

NOTE Five hours or 5 hours/100 kg.

- b) constraint rules associated with ordering or sequencing of segments.

A work process segment may be made up of other work process segments, in a hierarchy of definitions.

Work process segments may contain specifications of specific resources required by the Work process segment. Work process segments may contain parameters that can be listed in specific work requests.

Table 3 defines the attributes for *work process segment* objects.

Table 3 – Work process segment attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of a <i>work process segment</i> , within the scope of the information exchanged (<i>work capability</i> , <i>work schedule</i> , <i>work performance</i> ...)				
Work Type	Describes the category of work activity that would perform the work.				
Description	Additional information about the <i>work process segment</i> .				
Location	Identifies where the exchanged information fits within the role based equipment hierarchy. Optionally defines the scope of the process segment definition, such as the site or area it is defined for.				
Duration	Duration of process segment, if known.				
Duration Unit of Measure	The units of measure of the duration, if defined.				

6.3 Personnel segment specification

Personnel resources that are required for a work process segment shall be presented as personnel specifications. The attributes for this object are defined in Part 2.

6.4 Personnel segment specification property

Specific properties that are required are specified in personnel specification properties. The attributes for this object are defined in Part 2.

6.5 Equipment segment specification

Equipment resources that are required for a work process segment shall be presented as equipment segment specifications. The attributes for this object are defined in Part 2.

6.6 Equipment segment specification property

Specific properties that are required are specified in equipment segment specification properties. The attributes for this object are defined in Part 2.

6.7 Material segment specification

Material resources that are required for a work process segment shall be listed as material segment specifications. The attributes for this object are defined in Part 2.

6.8 Material segment specification property

Specific properties that are required are specified in material segment specification properties. The attributes for this object are defined in Part 2.

6.9 Work process segment parameter

Specific parameters required for a segment shall be shown as work process segment parameters.

Table 4 defines the attributes for *work process segment parameter* objects.

Table 4 — Work process segment parameter attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
Name	Name of the <i>work process segment parameter</i> .	Milling Time			
Description	Contains additional information of the <i>work process segment parameter</i> .	"Range of acceptable milling times."			
Value	The value, set of values, or range of acceptable values	{5..10}			
Unit of Measure	Unit of measure of the values, if applicable.	Minutes			

6.10 Work process segment dependency

Table 5 defines the attributes for *work process segment dependency* objects. The *work process segment dependencies* can be used to describe process dependencies that are independent of any particular work task.

NOTE For example, a process segment dependency may define that an testing segment must follow an assembly segment.

Table 5 — Work process segment dependency attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
Description	Contains additional information and descriptions of the <i>work process segment dependency</i> definition.	"Defines the ordering of assembly processes the Widget Assembly process segment"			
Dependency Type	Defines the execution dependency constraints of one segment by another segment	Start <i>Cleanout</i> no earlier than T (<i>Timing Factor</i>) after <i>Work</i> end			
Dependency Factor	Factor used by dependency	25			
Unit of Measure	The units of measure of the dependency factor, if defined.	Minutes			

EXAMPLE: Dependency type using A and B to identify the segments, or specific resources within the segments, and T to identify the timing factor, include:

- B can not follow A
- B may run in parallel to A

- B may not run in parallel to A
- Start B at A start
- Start B after A start
- Start B after A end
- Start B no later than T (Dependency Factor with time T) after A start
- Start B no earlier than T (Dependency Factor with time T) after A start
- Start B no later than T (Dependency Factor with time T) after A end
- Start B no earlier than T (Dependency Factor with time T) after A end

7 Work definition information

7.1 Work definition model

Work definition shall be used to specify the resources required to perform a specified unit of work. The actual definition of how to perform the work is not included in the object model. Figure 4 below is the common work definition model.

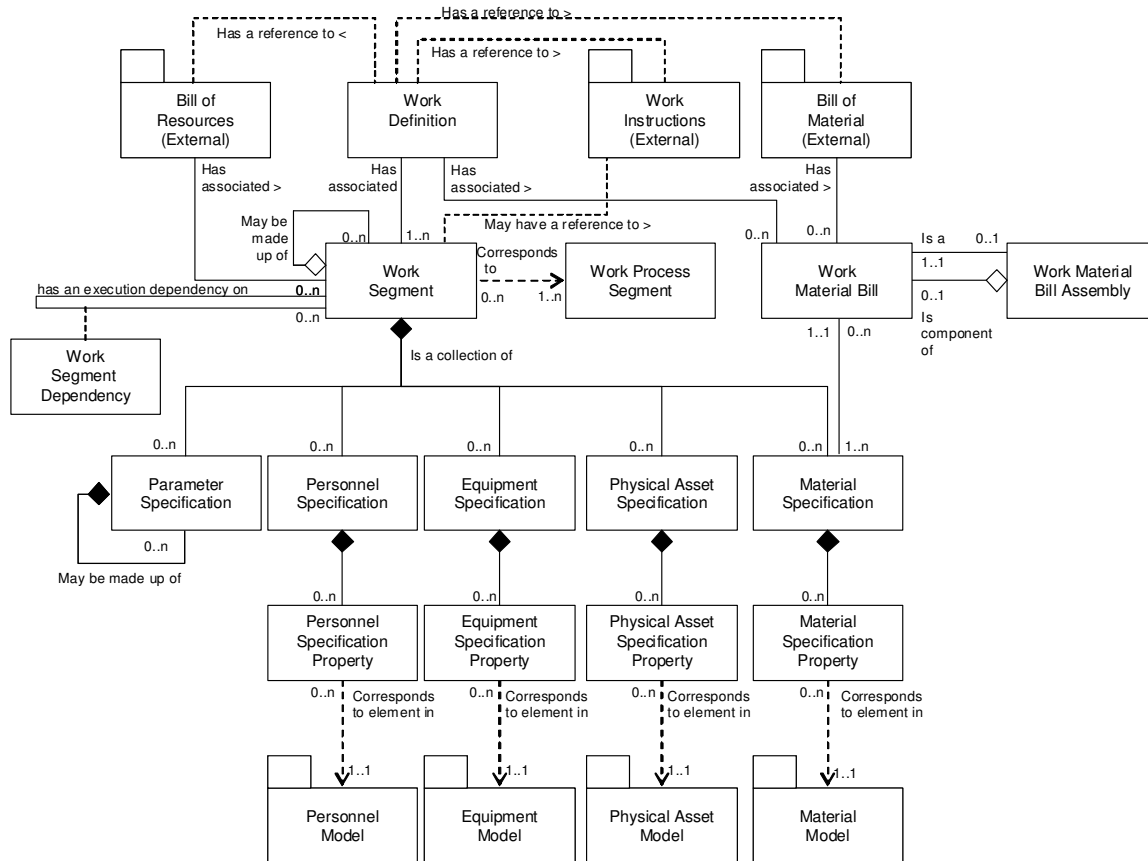


Figure 4 — Work definition model

7.2 Master work definition

TBD

7.3 Control work definition

TBD

7.4 Work definition

Table 6 defines the attributes for *work definition* objects.

Table 6 — Work Definition attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	Uniquely identifies the work definition.	Export Quality Widget	Medium Size AC Motor Overhaul	Potency Test Procedure	Tank Transfer Procedure
Version	An identification of the version of the <i>Work Definition</i> . In cases where there are multiple versions of a <i>Work Definition</i> , then the version attribute shall contain the additional identification information to differentiate each version.	1.0	1.4	1.1	1.1
Description	Contains additional information and descriptions of the <i>Work Definition</i>	“Information defining resources required for work of a single ‘Export Quality Widget’”.	For overhauls of motors less than 200 HP.	Test for potency of product	Movement of material from one tank to another
Work Type	Describes the category of work	Production	Maintenance	Quality	Inventory

NOTE A MIMOSA *Solution Package* is the equivalent of a Work Definition for maintenance.

7.5 Work material bill

Table 7 defines the attributes for *work material bill* objects.

Table 7 — Work material bill

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of a <i>work material bill</i> item.	10000827	552619		
Description	Contains additional information of the <i>work material bill</i> .	“All materials required in the manufacturing process for a single widget.”			
Material Class	Identifies the associated <i>material class</i> or set of <i>material classes</i> required. Only the material class or the material property is usually defined.	{Polymer sheet stock 1001A, Rivets}	{Bearing, Grease}		
Material Definition	Identifies the associated <i>material definition</i> or set of <i>material definitions</i> required.	{Sheet stock 1443a , Rivet-10002}	{20 mm Bearing, NLGI Grade 2 Grease}		
Quantity	Specifies the amount of resources required.	{1.0, 26}	{2, 30}		
Quantity Unit of Measure	The unit of measure of the associated quantity, if applicable.	{Sheets / piece, Number / piece}	{piece, ml}		

7.6 Work material bill assembly

Fejl! Henvisningskilde ikke fundet. defines the attributes for *work material bill assembly* objects.

Table 8 — Work material bill assembly

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	An identification of the material work bill assembly. Note: Typically this would be the same as the ID of the parent work material lot.	T456WP	Oil Sample 77276	Rear Stabilizer 67466	SKU6635
Description	Additional information about the material work bill assembly.	Transmission	Combined Oil Sample	Parts of rear stabilizer	Pallet

7.7 Work segment

A work segment may have a reference to work instructions that corresponds to the instructions required to implement the specific work definition segment when more granularity is needed than one work instruction for the work definition.

Table 9 defines the attributes for *work segment* objects.

Table 9 — Work segment attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of a specific segment within the scope of the information exchanged.	Final Polished Widget	200 HP AC Motor Disassemble		
Description	Contains additional information of the segment	"A brightly polished widget."	Disassembly of motor prior to rebuild		
Duration	Duration of segment, if known.	25 Minutes	4		
Duration Unit of Measure	The units of measure of the duration, if defined.	Minutes	Hours		
Work Process Segment	Identifies the associated Work process segments. There may be multiple alternate work process segments that could be used for the work definition segment.	Widget Polishing	AC Motor Disassemble		
Work Type	Describes the category of work	Production	Maintenance		

7.8 Parameter specification

A work definition may have an associated set of zero or more parameter specifications per work process segment for each step of work. The parameter specification contains the names and types of the values that may be sent to the Level 3 systems to parameterize the work.

NOTE Examples of parameter specifications are pH of 3.5, pressure limit of 35 psi, and flange color = orange.

The attributes of this object are defined in Part 2.

7.9 Personnel specification

An identification, reference, or correspondence to a personnel capability shall be presented as a personnel specification. A personnel specification usually specifies personnel class but may specify a person. This identifies the specific personnel capability that is associated with the identified work definition segment or product segment.

A personnel specification shall include

- a) an identification of the personnel capability needed;
- b) the quantity of the personnel capability needed;
- c) the unit of measure of the quantity.

Specific elements associated with a personnel specification may be included in one or more personnel specification properties.

NOTE Examples of personnel specification properties are training level required, specific skill required, and exposure availability.

The attributes for this object are defined in Part 2.

7.10 Personnel specification property

The attributes for this object are defined in Part 2.

7.11 Equipment specification

An identification, reference, or correspondence to an equipment capability shall be used as an equipment specification. An equipment specification may specify either an equipment class or a piece of equipment. This identifies the specific equipment capability that is associated with the segment.

The attributes for this object are defined in Part 2.

Specific elements associated with an equipment specification may be included in one or more equipment specification properties.

NOTE Examples of equipment specification properties are material of construction, maximum material capacity, and minimum heat extraction amount.

7.12 Equipment specification property

The attributes of this object are defined in Part 2.

7.13 Physical asset specification

An identification, reference, or correspondence to a physical asset capability shall be used as a physical asset specification. A physical asset specification may specify either a physical asset or a Physical Make And Model. This identifies the specific physical asset capability that is associated with the segment.

The attributes of this object are defined in Part 2.

Specific elements associated with a physical asset specification may be included in one or more physical asset specification properties.

7.14 Physical asset specification property

The attributes of this object are defined in Part 2.

7.15 Material specification

An identification or correspondence to a material capability shall be presented as a material specification. A material specification specifies a material or a material class. This identifies the specific material specification that is associated with the identified product segment.

The attributes of this object are defined in Part 2.

Specific elements associated with a material specification may be included in one or more material specification properties.

NOTE Examples of material specification properties are colour range, density tolerance, and maximum scrap content.

7.16 Material specification property

The attributes of this object are defined in Part 2.

7.17 Work segment dependency

The *work segment dependencies* can be used to describe dependencies that are work or product specific.

EXAMPLE A wheel assembly and a frame assembly can run in parallel.

Table 10 lists the attributes of a work segment dependency.

Table 10 — Work segment dependency attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
Description	Contains additional information and descriptions of the <i>work definition segment dependency</i> definition for a specific segment.	“Defines the ordering of widget washing during the Widget Assembly product segment”			
Dependency Type	Defines the execution dependency constraints of one segment by another segment.	Start <i>Acid Addition</i> no later than <i>T</i> (<i>Timing Factor</i>) after <i>Reaction Complete</i> end			
Dependency Factor	Factor used by dependency	25			
Unit of Measure	The units of measure of the dependency factor, if defined.	Minutes			

EXAMPLE: Dependency type using A and B to identify the segments, or specific resources within the segments, and T to identify the timing factor, include:

- B can not follow A
- B may run in parallel to A
- B may not run in parallel to A
- Start B at A start
- Start B after A start
- Start B after A end
- Start B no later than T (Dependency Factor with time T) after A start
- Start B no earlier than T (Dependency Factor with time T) after A start
- Start B no later than T (Dependency Factor with time T) after A end
- Start B no earlier than T (Dependency Factor with time T) after A end

8 Work schedule information

8.1 Work schedule model

A request for work shall be listed as a work schedule. A work schedule shall be made up of one or more work requests.

The work schedule may apply to scheduling of Production, Maintenance, Quality Test and Inventory, or to other extended categories of activities.

Figure 5 is the work schedule model.

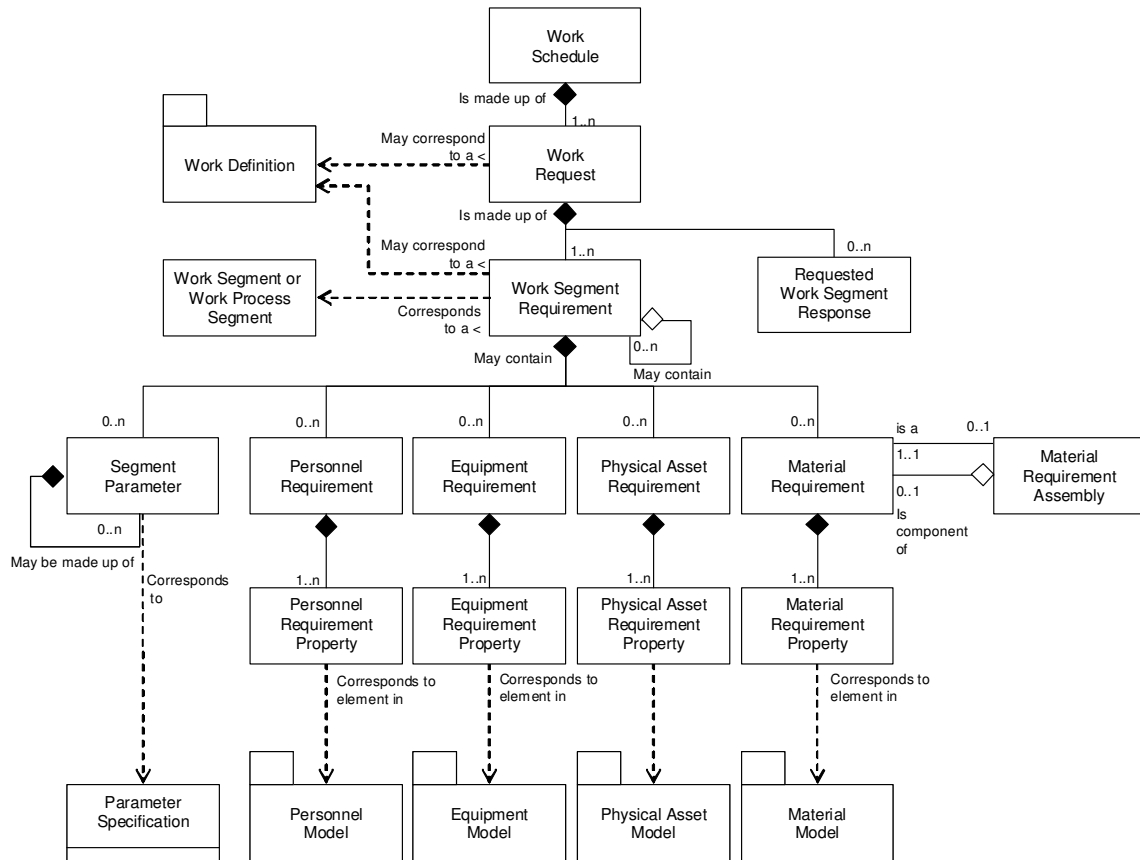


Figure 5 — Work schedule model

8.2 Work schedule

A request for work shall be listed as a work schedule. A work schedule shall be made up of one or more work requests.

A work schedule may be defined for any specific category of work; production, maintenance, quality, or inventory, or it may be defined for a combination of categories. When a combination is selected, then the work requests or segment requirement specifies the category of the work.

Table 11 defines the attributes for *work schedule* object.

Table 11 — Work schedule attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of the <i>work schedule</i> and could include version and revision identification. The ID shall be used in other parts of the model when the <i>work schedule</i> needs to be identified.	PMMFUF	MWOIDND	QNFKVUV	IECBDU
Work Type	Describes the category of work. Required attribute Defined values are: Production, Maintenance, Quality, Inventory, and Mixed. “Mixed” shall be used when the work schedule contains several types of work requests and/or segment requirements.	Production	Maintenance	Quality	Inventory
Description	Contains additional information and descriptions of the <i>work schedule</i> .	“Widget manufacturing schedule.”	“Daily Planned Maintenance”	“Widget raw material testing schedule.”	“Widget raw material staging schedule.”
Start Time	The starting time for the associated <i>work schedule</i> , if applicable.	10-28-2006	10-28-2006	10-28-2006	10-28-2006
End Time	The ending time for the associated <i>work schedule</i> , if applicable.	10-30-2006	10-30-2006	10-30-2006	10-30-2006
Published Date	The date and time on which the <i>work schedule</i> was published or generated.	12-30-1951 18:30 UTC	10-17-2005 18:30 UTC	10-17-2005 18:30 UTC	10-17-2005 18:30 UTC
Location	Identifies where the exchanged information fits within the role based equipment hierarchy.	East Wing Manufacturing Line #2	CNC Machine Asset ID 13465	Test Cell 4 Receiving	Warehouse B

NOTE A MIMOSA *Segment Request for Work* and an *Asset Request for Work* are the equivalent of a Work Request for either equipment or for a physical asset. The table of *Request for Work* is the equivalent of the Work Schedule.

8.3 Work request

A request for work for an element of work identified by work definition shall be shown as a work request. A work request contains the information required by manufacturing to fulfill scheduled work. This may be a subset of the business information, or it may contain additional information not normally used by the business system.

A work request may identify or reference the associated work instructions. A work request shall contain at least one segment requirement, even if it spans all of the work.

A work request may include

- a) when to start work, typically used if a scheduling system controls the schedule;

- b) when the work is to be finished, typically used if the manufacturing operations system controls its internal schedule to meet deadlines;
- c) the priority of the request, typically used if exact ordering of production is not externally scheduled;

A work request may be reported on by one or more work responses. Additional information may be described in the production parameters, personnel requirements, equipment requirements, and material requirements.

Table 12 defines the attributes for *work request* objects.

Table 12 — Work request attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of the <i>work request</i> . The ID shall be used in other parts of the model when the <i>work request</i> needs to be identified.	1001091			
Work Type	Describes the category of work. Required attribute Defined values are: Production, Maintenance, Quality, Inventory, and Mixed. “Mixed” shall be used when the work request contains several types of segment requirements.	Production	Maintenance	Quality	Inventory
Description	Contains additional information and descriptions of the <i>work request</i> .	“Work Request for export quality widgets for October 29, 1999.”			
Work Definition	Identifies the associated <i>Work Definition</i> to be used, if applicable.	Export Quality Widget			
Start Time	When work is to be started, if applicable.	1999-10-27 8:00 UTC			
End Time	When work is to be completed, if applicable.	1999-10-27 17:00 UTC			
Priority	The priority of the request, if applicable.	Highest			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy.	East Wing Manufacturing Line #2	CNC Machine Asset ID 13465	Test Cell 4 Receiving	Warehouse B

8.4 Work segment requirement

A work process segment and a production request shall be made up of one or more segment requirements. Each segment requirement shall correspond to, or reference, an identified work definition segment or work process segment. The segment requirement identifies or references

the segment capability to which the associated personnel, equipment, materials, and segment parameters correspond.

The personnel requirement property, equipment requirement property and product parameter shall align with the personnel property, equipment property, and product parameters sent as part of a production request. If the scheduling function sends information that is not understood by the receiving control function, then that information cannot be used within the control function. Likewise the scheduling function has to be able to determine what information can be accepted by the control function.

Table 13 defines the attributes for *segment requirement* object.

Table 13 — Segment requirement attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of the <i>segment requirement</i> within the scope of a <i>work request</i> .	A6646			
Work Type	Describes the category of work. Required attribute. Defined values are: Production, Maintenance, Quality, Inventory, and Mixed.	Production			
Segment	An identification of the segment associated with the <i>segment requirement</i> , if applicable.	Polishing Segment			
Description	Contains additional information and descriptions of the <i>segment requirement</i> .	"Polishing segment, containing specifications for personnel, materials and equipment."			
Earliest Start Time	The expected earliest start time of this <i>segment requirement</i> , if applicable.	1999-10-27 14:13 UTC			
Latest End Time	The expected latest ending time of this <i>segment requirement</i> , if applicable.	1999-10-27 16:55 UTC			
Duration	The expected duration of this segment requirement, if applicable. Note, this should match the associated segment duration.	15			
Duration Unit of Measure	The unit of measure of the duration, if applicable.	Minutes			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy.	East Wing Manufacturing Line #2			

EXAMPLE There may are multiple segments defined. There is one master segment of work that applies to the entire work request. The master segment is made up of multiple nested segments for individually specified and reported segments of work.

NOTE Information that applies across all segments of the work request, such as a customer name, may be represented as a work parameter in the master segment. Information that applies to specific segments may be specified as part of the segment.

8.5 Segment parameter

Information contained in the enterprise system that is required by the operation system for correct manufacturing shall be known as segment parameters.

The attributes for this object are defined in Part 2.

A segment parameter should include a set of limits that apply to any change to the value, such as quality limits and safety limits.

8.6 Personnel requirement

The identification of the number, type, duration, and scheduling of specific certifications and job classifications needed to support the current work request shall be identified as a personnel requirement. Properties of the personnel requirement shall be identified as personnel requirement properties.

EXAMPLE 1 Job classification may include mechanics, operators, health and protection, and inspectors.

EXAMPLE 2 There may be a requirement for one operator with a specified level of certification available 2 h after production starts. There would be one personnel requirement for the requirement for the operator and two personnel requirement properties, one for the certification level and one for the time requirement.

The attributes for this object are defined in Part 2.

Specific elements associated with each personnel requirement may be included in one or more personnel requirement properties.

NOTE Examples of personnel requirement property elements are training and certification, specific skill, physical location, seniority level, exposure level, training certification, security level, experience level, physical requirements, and overtime limitations and restrictions.

8.7 Personnel requirement property

The attributes for this object are defined in Part 2.

8.8 Equipment requirement

The identification of the number, type, duration, and scheduling of specific equipment and equipment classifications or equipment constraints needed to support the current work request shall be used as an equipment requirement. Properties of the equipment requirement shall be identified as equipment requirement properties. The work request may include one or more equipment requirements. Requirements can be as generic as materials of construction, or as specific as a particular piece of equipment. Each of these requirements shall be an instance of the equipment requirement class.

The attributes for this object are defined in Part 2.

Each equipment requirement identifies a general class of equipment (such as reactor vessels), a specific class of equipment (such as isothermal reactors), or a specific piece or set of equipment (such as isothermal reactor #7). The specific requirements on the equipment, or equipment class are listed as equipment requirement property objects.

Specific elements associated with each equipment requirement may be included in one or more equipment requirement properties.

NOTE Examples of equipment requirement properties are material of construction and minimum equipment capacity.

8.9 Equipment requirement property

The attributes for this object are defined in Part 2.

8.10 Physical asset requirement

The identification of the number, type, duration, and scheduling of specific physical assets and physical make and model constraints needed to support the current work request shall be used as a physical asset requirement.

Properties of the physical asset requirement shall be identified as physical asset requirement properties. The work request may include one or more physical asset requirements. Requirements can be as generic as materials of construction, or as specific as a particular piece of physical asset. Each of these requirements shall be an instance of the physical asset requirement class.

The attributes for this object are defined in Part 2.

Specific elements associated with each physical asset requirement may be included in one or more physical asset requirement properties.

NOTE Examples of physical asset requirement properties are material of construction and minimum physical asset capacity.

8.11 Physical asset requirement property

The attributes for this object are defined in Part 2.

8.12 Material requirement

An identification of a material that is expected to be used in the work request shall be presented as a material requirement. Material requirements contain definitions of materials that may be consumed, produced, replaced, sampled, or otherwise used in manufacturing.

The attributes for this object are defined in Part 2.

8.13 Material requirement property

Properties of the material requirement shall be identified as material requirement properties. Specific elements associated with each material requirement may be included in one or more material requirement properties.

The attributes for this object are defined in Part 2.

8.14 Material requirement assembly

A Material Requirement Assembly defines the collection of material that is an assembly of a parent material.

The attributes for this object are defined in Part 2.

8.15 Requested segment response

The identification of the information sent back as a result of the *production request* is a *requested segment response*. This information is of the same form as a *segment response*, but without actual values. (see the Clause 9.4)

A *requested segment response* may include required information, which presents information reported on from production, such as the actual amount of material consumed.

A *requested segment response* may include optional information, which presents information that may be reported on from production, such as operator-entered comments.

9 Work performance information

9.1 Work performance model

Work performance is a report on requested manufacturing and is a collection of work responses. Work responses are responses from manufacturing that are associated with a Work request. There may be one or more Work responses for a single Work request if the manufacturing facility needs to split the Work request into smaller elements of work.

Figure 6 is the work performance model.

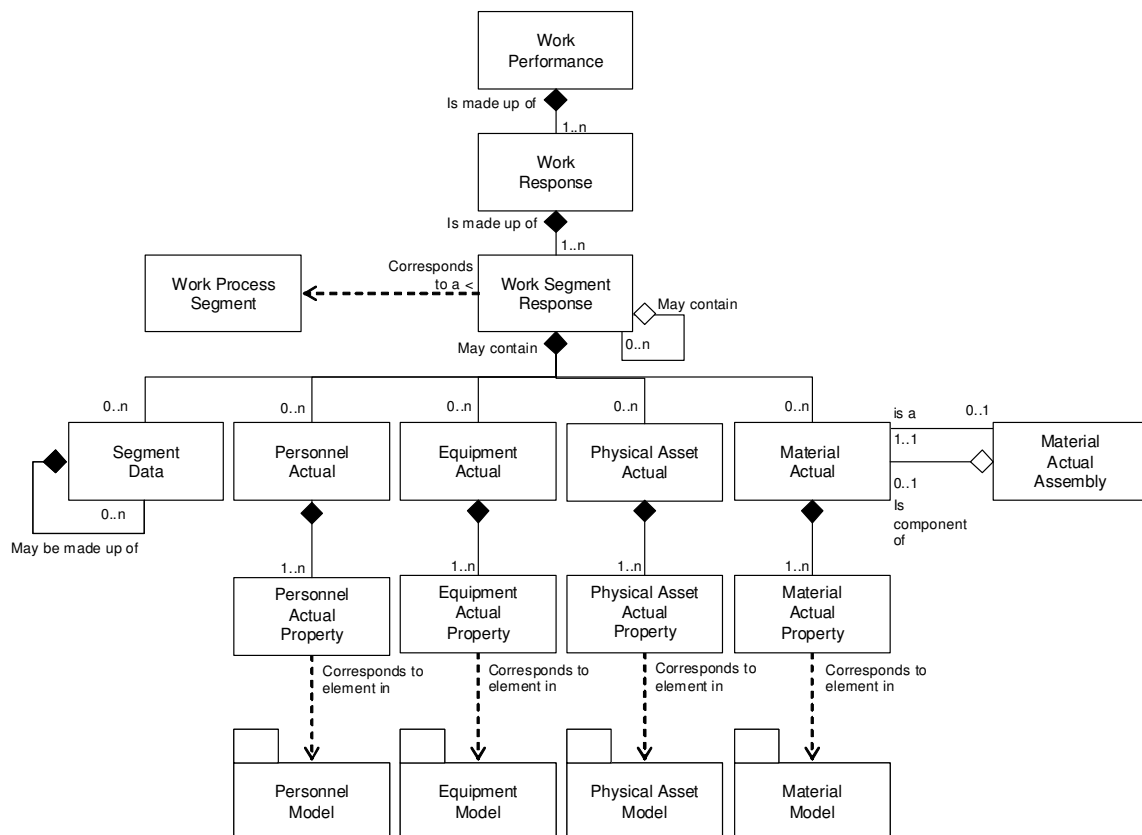


Figure 6 — Work performance model

9.2 Work performance

The performance of the requested manufacturing requests shall be listed as work performance. Work performance shall be a collection of work responses.

Table 14 defines the attributes for *work performance* objects.

Table 14 — Work performance attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of the <i>work performance</i> and could include version and revision identification. The ID shall be used in other parts of the model when the <i>work performance</i> needs to be identified.	1999-10-27-A15			
Work Type	Describes the category of work	Production	Maintenance	Quality	Inventory
Description	Contains additional information and descriptions of the <i>work performance</i> .	"Work performance report on Oct 27, 1999 work schedule."			
Work Schedule	An identification of the associated <i>work schedule</i> , if applicable. <i>Work performance</i> may not relate to a <i>work schedule</i> , it may be a report on all work for a specific time, or reported on by plant floor events.	1999-10-27-A15			
Start Time	The starting time of the associated <i>work performance</i> , if applicable.	10-28-1999			
End Time	The ending time of the associated <i>work performance</i> , if applicable.	10-30-1999			
Published Date	The date and time on which the <i>work performance</i> was published or generated.	10-27-1999 13:42 EST			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy.	East Wing Manufacturing Line #2			

9.3 Work response

The responses from manufacturing that are associated with a work request shall be used as work responses. There may be one or more work responses for a single work request if the manufacturing facility needs to split the work request into smaller elements of work.

A work response may include the status of the request, such as the percentage complete, a finished status, or an aborted status.

Table 15 defines the attributes for *work response* objects.

Table 15 — Work response attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	An identification within the associated <i>work response</i> . The ID shall be used in other parts of the model when the <i>work response</i> needs to be identified.	1001091			
Work Type	Describes the category of work	Production	Maintenance	Quality	Inventory
Work Request	An identification of the associated <i>work request</i> , if applicable. <i>Work response</i> may not relate to a <i>work request</i> , it may be a report on all work for a specific time, or reported on by plant floor events.	1001091			
Work Definition	Identifies the associated <i>Work Definition</i> that was used, if applicable. This may not match the request, if alternate specifications are allowed.	Export Quality Widget			
Work Definition Version					
Start Time	The starting time of this <i>work response</i> .	1999-10-27 8:33 UTC			
End Time	The ending time of this <i>work response</i> .	1999-10-27 16:55 UTC			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy.	East Wing Manufacturing Line #2	CNC Machine Asset ID 13465	Test Cell 4 Receiving	Zone B

9.4 Work segment response

Information on a segment of work for a work response shall be used as a segment response. A segment response shall be made up of zero or more sets of information on work or segment data, personnel actual, equipment actual, and material actual.

A segment response shall include

- a) an identification of the associated work process segment;
- b) the actual starting time of the segment;
- c) the actual stopping time of the segment.

NOTE: A response actual may contain information that defines if the response was required or optional when the segment response is used as a requested segment response.

Table 16 defines the attributes for *work segment response* objects.

Table 16 — Work segment response attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	Uniquely identifies an instance of a <i>work process segment</i> executed. (Note: the same process segment may be executed multiple times in work.)	A54-1			
Work Type	Describes the category of work	Production	Maintenance	Quality	Inventory
Process Segment	An identification of the <i>work process segment</i> associated with the <i>segment response</i> .	Master Segment			
Description	Contains additional information and descriptions of the <i>segment response</i> .	“Master segment, containing material produced actuals.”	“Part 34447 replaced with Part 77282 after original broke during repair”		
Actual Start Time	The actual start time of this <i>segment response</i> .	1999-10-27 8:33 UTC			
Actual End Time	The actual end time of this <i>segment response</i> .	1999-10-27 16:55 UTC			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy.	East Wing Manufacturing Line #2	CNC Machine Asset ID 13465	Test Cell 4 Receiving	Warehouse B

EXAMPLE: There may be multiple segments defined. There may be one master segment of work that applies to the entire work response. The master segment is made up of multiple nested segments for individually reported segments of work.

Information that applies across all segments of the work response, such as a final material produced, may be represented as a material produced in the master segment.

Information that applies to specific segments of work, such as widget polishing equipment actually used may be reported as part of the polishing segment.

9.5 Segment data

Other information related to the actual work made shall be presented as segment data.

The attributes for this object are defined in Part 2.

9.6 Personnel actual

An identification of a personnel capability used during a specified segment shall be used as personnel actual. Work functions often require people as a resource to carry out tasks.

The attributes for this object are defined in Part 2.

Specific information about personnel actuals shall be listed in personnel actual properties.

NOTE Examples of personnel actual properties are

- the actual duration of use of the personnel during the product segment, such as 2 h; this information is often needed for actual costing analysis;
- actual monitored exposure times by the personnel during the product segment;
- the location of the personnel after use in the product segment, such as area 51; this information is often used for short-term scheduling of personnel resources.

9.7 Personnel actual property

The attributes for this object are defined in Part 2.

9.8 Equipment actual

An identification of an equipment capability used during a specified segment shall be identified as an equipment actual. Work functions often require equipment as a resource to carry out tasks.

The attributes for this object are defined in Part 2.

Specific information about equipment actuals shall be listed in equipment actual properties.

NOTE Examples of equipment actual properties are

- the actual duration of use of the equipment during the product segment; this information is often needed for actual costing analysis;
- the equipment condition, after use in the product segment, such as a status of available, out-of-service, or cleaning; this information is often used for short-term scheduling of equipment resources;
- the equipment set-up procedures used for the product segment; this information is often needed for actual costing analysis and scheduling feedback;
- other equipment attributes, such as percentage of available capability used.

9.9 Equipment actual property

The attributes for this object are defined in Part 2.

9.10 Physical asset actual

An identification of a physical asset capability used during a specified segment shall be identified as an physical asset actual. Work functions often require physical asset as a resource to carry out tasks.

The attributes for this object are defined in Part 2.

Specific information about physical asset actuals shall be listed in physical asset actual properties.

9.11 Physical asset actual property

The attributes for this object are defined in Part 2.

9.12 Material actual

An identification of a material that was used in the work request shall be presented as a material actual. Material actual contain definitions of materials that may have be consumed, produced, replaced, sampled, or otherwise used in manufacturing.

The attributes for this object are defined in Part 2.

9.13 Material actual property

The attributes for this object are defined in Part 2.

9.14 Material actual assembly

A Material Actual Assembly defines the collection of materials that are an assembly of a parent material. Table **Fejl! Henvisningskilde ikke fundet.** defines the attributes for *material actual assembly* objects.

The attributes for this object are defined in Part 2.

10 Work capability information

10.1 Work capability model

Work capability information is the collection of information about all resources for work for selected future and past times. This is made up of information about equipment, material, personnel, and work process segments. Work capability describes the names, terms, statuses, and quantities of which the manufacturing control system has knowledge.

Work capability is defined as a collection of personnel capabilities, equipment capabilities, material capabilities, and process segment capabilities, for a given slice of time (past, current, or future), and defined as committed, available, and unattainable.

Figure 7 is the work capability model that applies to production, maintenance, quality test and inventory.

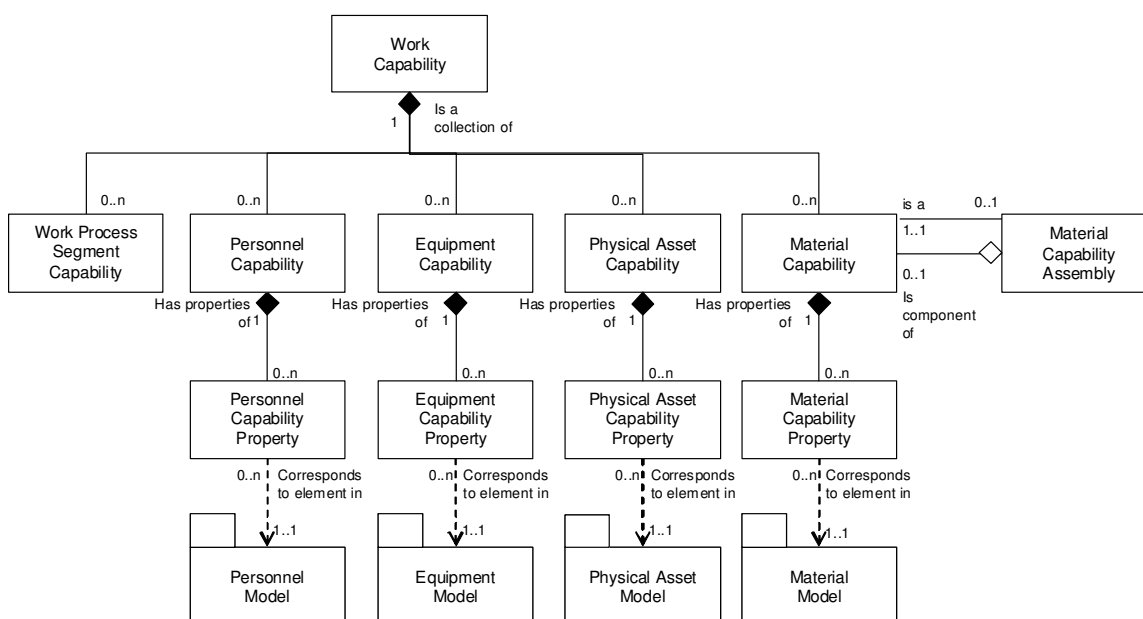


Figure 7 — Work Capability Model

10.2 Work capability

Table 17 defines the attributes for *work capability* objects.

Table 17 — Work capability attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	Defines a unique instance of a work capability for a specified element of the equipment hierarchy model [Part 1 Clause 5.2] (<i>enterprise, site, area, work ceter, or work unit</i>).	1999/12/30-HPC52			
Description	Contains additional information and descriptions of the <i>work capability</i> definition.	"One day's work capacity for the Boston Widget Company."			
Capacity Type	The capacity type: Used, Unused, Total, Available, Unattainable, or Committed.	Available			
Reason	Defines the reason for the capability type. Example 1: If committed, then committed for work or for maintenance, or if unavailable, then the reason for the unavailability. Example 2: If unused capacity, then the reason for the capacity was unused, such as a specific equipment failure or unacceptable product quality	Available for Work			
Confidence Factor	A measure of the confidence of the capacity value. Example 3: A percentage value representing the confidence of the capacity	90%			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy. Zero or more as required to identify the specific scope of the work capability definition.	Boston Widget Company			
Start Time	The starting date and time of the work capability.	1999-12-29 11:59			
End Time	The ending date and time of the work capability.	1999-12-30 12:00			
Published Date	The date and time on which the <i>work capability</i> was published or generated.	1999-11-03 13:55			

10.3 Personnel capability

A representation of the capability of persons or personnel classes that is committed, available, or unattainable for a defined time shall be known as a personnel capability. Personnel capability may contain references to either persons or personnel classes.

The attributes for this object are defined in Part 2.

Specific personnel capabilities shall be presented in personnel capability properties. The personnel capability property may include the quantity of the resource referenced.

NOTE For example, 3 horizontal drill press operators available for the third shift on 2000-02-29.

Where *persons* are members of multiple *personnel classes* then the *personnel capability* information defined by *personnel class* should be used carefully because of possible double counts, and personnel resources should be managed at the instance level.

10.4 Personnel capability property

The attributes for this object are defined in Part 2.

10.5 Equipment capability

A representation of the capability of equipment or equipment classes that is committed, available, or unattainable for a specific time shall be used as an equipment capability. Equipment capability may contain references to either equipment or equipment classes.

The attributes for this object are defined in Part 2.

Specific equipment capabilities shall be used in equipment capability properties. The equipment capability properties may include the quantity of the resource referenced.

NOTE For example, 3 horizontal drill presses currently available.

Where *equipment* are members of multiple *equipment classes* then the *equipment capability* information defined by *equipment class* should be used carefully because of possible double counts, and equipment resources should be managed at the instance level.

10.6 Equipment capability property

The attributes for this object are defined in Part 2.

10.7 Physical asset capability

A representation of the capability of a physical asset or class of physical assets (physical make and model) that is committed, available, or unattainable for a specific time shall be used as a physical asset capability. Physical asset capability may contain references to either physical asset or physical make and model.

The attributes for this object are defined in Part 2.

Specific physical asset capabilities shall be used in physical asset capability properties. The physical asset capability properties may include the quantity of the resource referenced.

10.8 Physical asset capability property

The attributes for this object are defined in Part 2.

10.9 Material capability

A representation of the capability of material that is committed, available, or unattainable for a specific time shall be used as a material capability. Material capability is used for material lots or sublots. This includes information that is associated with the functions of material and energy control and product inventory control. The currently available and committed material capability is the inventory. WIP (work in progress) is a material capability currently under the control of production.

The attributes for this object are defined in Part 2.

Specific material capabilities shall be listed in material capability properties. The material capability properties may include the quantity of the material referenced.

NOTE For example, 3 sublots in building 3 of material starch lot #12345 committed to production for 2000-02-29.

Where *materials* are members of multiple *material classes* then the *material capability* information defined by *material class* should be used carefully because of possible double counts, and material resources should be managed at the instance level.

10.10 Material capability property

The attributes for this object are defined in Part 2.

10.11 Material capability assembly

A Material Capability Assembly defines a capability for the production or consumption of a collection of material.

1. A Material Capability may only contain one Material Capability Assembly.
2. A Material Capability may only be a member of one Material Capability Assembly.
3. A Material Capability Assembly may contain multiple Material Capabilities.
4. A Material Capability Assembly may be a collection of identifications of material capabilities.

The attributes for this object are defined in Part 2.

11 Work process segment capability information

11.1 Work process segment capability model

A work process segment capability is a representation of a logical grouping of personnel resources, equipment resources, and material that is committed, available, or unavailable for a defined work process segment for a specific time.

A representation of a logical grouping of personnel resources, equipment resources, and material that is committed, available, or unavailable for a given work process segment for a specific time shall be used as a work process segment capability, as shown in Figure 8.

A work process segment capability is related to a work process segment that can occur during work, as presented in the work definition.

Work process segment capability shall identify

- a) the capability type (available, unattainable, committed, used, unused, total);
- b) the time associated with the capability (for example, third shift on a specific date).

Work process segment capabilities shall be made up of

- c) personnel segment capabilities, which lists specific properties required in personnel segment capability properties;
- d) equipment segment capabilities, which lists specific properties required in equipment capability properties;
- e) material segment capabilities, which lists specific properties required in material segment capability properties.

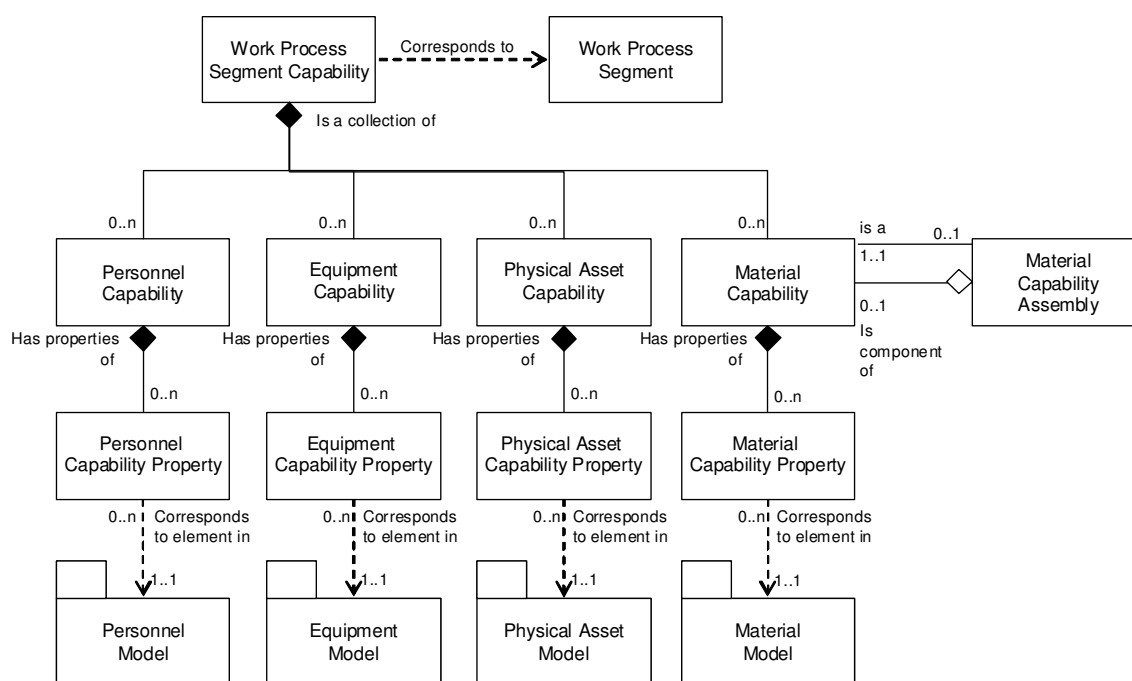


Figure 8 — Work process segment capability object model

11.2 Work process segment capability

Table 18 lists the attributes of *work process segment capability*. *Work process segment capability* has an equivalent structure to the personnel, equipment and material structure of *work capability*, except the *work process segment capability* is defined for a specific *work process segment*.

Table 18 — Work process segment capability attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
Description	Contains additional information and descriptions of the <i>work process segment capability</i> definition.	"Defines the available capability for the Widget Assembly process segment"			
Process Segment	Identifies the <i>work process segment</i> .	Widget Assembly			
Capacity Type	The capacity type: Available, Unattainable, or Committed.	Available			
Reason	Gives the reason for the capacity type.	Available for Production			
Location	Identifies where the exchanged information fits within the role based equipment hierarchy. If omitted, then the capability is associated to the parent <i>work process segment capability</i> location. Zero or more as required to identify the specific scope of the production capability definition.	Production Line #15			
Start Time	The starting time of the time span defining the capacity type. If omitted, then the capability is associated to the parent <i>work process segment capability</i> start time.	1999-12-30 11:59			
End Time	The ending time of the time span defining the capacity type. If omitted, then the capability is associated to the parent <i>work process segment capability</i> end time.	2000-01-01 12:00			

Work process segment capabilities should be used carefully because of possible double counts of resources.

EXAMPLE A resource may be shown as available in multiple *work process segments*, but in actual fact may be available for use in only a single *work process segment*.

11.3 Personnel capability

TBD

11.4 Equipment capability

TBD

11.5 Physical asset capability

TBD

11.6 Material capability

TBD

11.7 Material capability assembly

TBD

12 Work dispatch list

13 Work history

TBD

14 Work KPI

TBD

15 Work production record

TBD

16 List of objects

The following tables present a complete list of the objects discussed in this standard.

Table 19 — Common resource objects

EDITOR'S NOTE: These tables will be created once the draft is stable, so they do not have to be maintained prior to agreement by the committee.

17 Compliance

Any assessment of compliance of a specification shall be qualified by the following:

- a) The use of the terminology defined in this part
- b) The object models supported (Personnel, Material, Equipment, Process Segment, Production Capability, Process Segment Capability, Product Definition, Production Schedule, and Production Performance)
- c) The use of objects listed in Clause 4.15 that are supported
- d) The use of the attributes for each supported object
- e) The relationships between the supported objects
- f) A statement of the total compliance concerning definitions, objects, attributes, and relationships or, in case of partial compliance, a statement identifying explicitly the areas of noncompliance.

Annex A (Informative) Bibliography

MIMOSA OSA-EAI CCOM V3.2 – www.mimosa.org

Annex B
(Informative)
Questions and answers about object use