MESA INTERNATIONAL
Driving Operations Excellence


# Business To Manufacturing Markup Language

## Production Performance

## Version 6.0 - March 2013

## B2MML-V06RC02-ProductionPerformance

IMPORTANT: While the information, data, and standards provided in this publication were developed and are presented in good faith in accordance with a reasonable process that was subject to intellectual property and antitrust policies to benefit the industry as a whole, the publication is provided “as is” for information and guidance only, and there is no representation or warranty of any type or kind, including but not limited to warranties of merchantability or fitness for a particular purpose, and no warranty that use of the information, data, or standards will not infringe patent, copyright, trademark, trade secret, or other intellectual property rights of any party.



Material from ANSI/ISA-88 and ANSI/ISA-95 series of standards used with permission of ISA - The Instrumentation, Systems, and Automation Society, www.isa.org

# Table of Contents

## CHANGE HISTORY

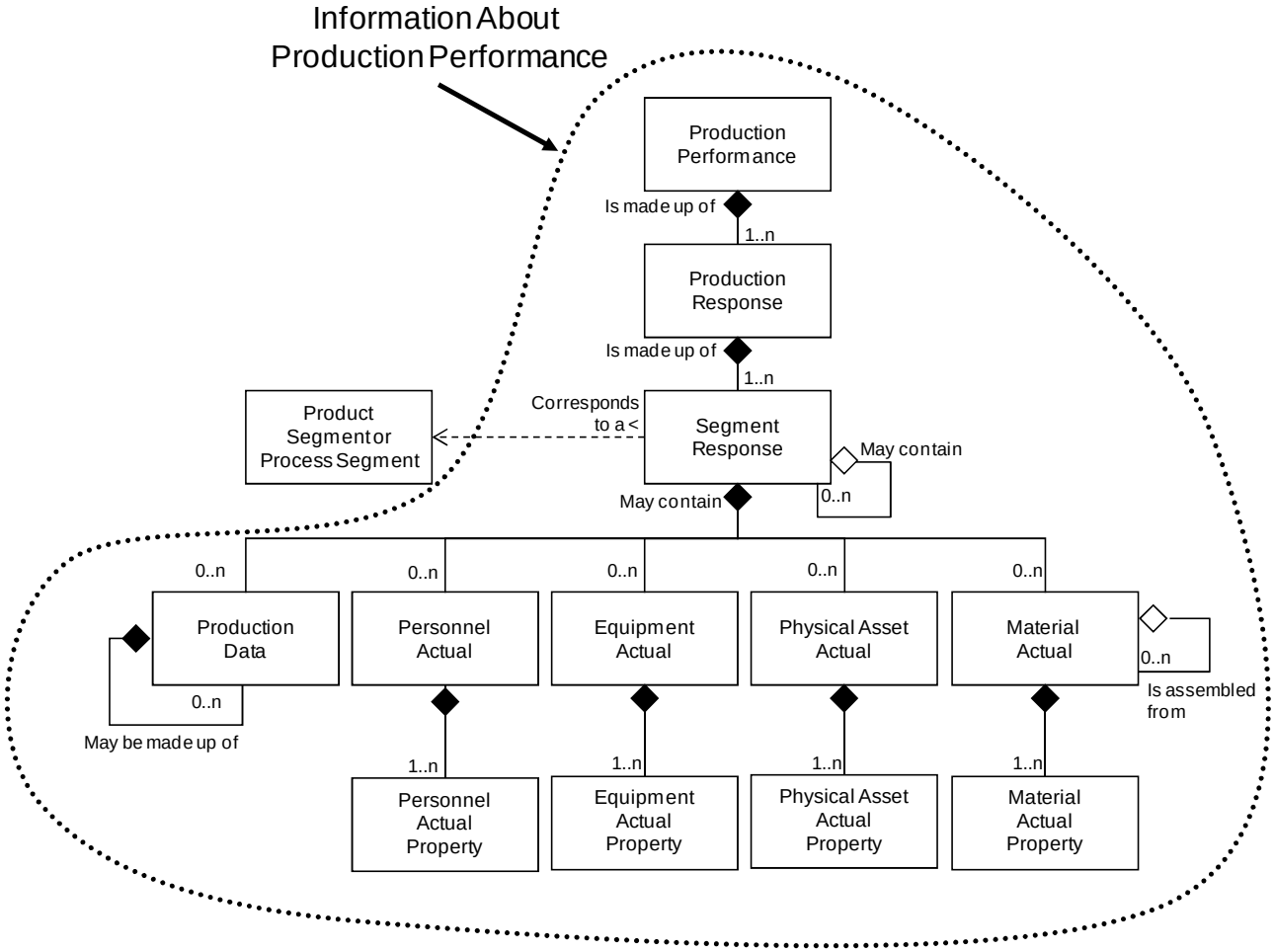
| Change | Date | Person | Description |
|---|---|---|---|
| V01 | 7 April 2002 | Dennis Brandl<br>Dave Emerson | Initial release |
| V02 | 23 Sept 2003 | Dennis Brandl<br>Dave Emerson | • Added *Location* to resource actual types<br>• Added *SegmentState* to *SegmentResponseType*<br>• Changed ##any to "Any" element of type "AnyType"<br>• Added *ProductSegmentID* to *SegmentResponseType* so it may be associated with process or product segments. |
| V03 | 26 Aug 2005 | Dennis Brandl<br>Dave Emerson | • Added substitution groups. One group added just before each Any element. |
| V0301 | 29 Dec 2005 | Dennis Brandl | • Changed “Value” elements to 0..unbounded |
| V04 | 04 June 2007 | Dennis Brandl | • Added transaction elements<br>• Added MaterialActual to replace MaterialProducedActual, MaterialConsumedActual, and ConsumableActual. |
| V0401 | Oct 2008 | Dennis Brandl | • Added maxOccurs to resources in segment responses. |
| V0500 | Mar 2011 | Dennis Brandl | • Updated for ISA 95.02-2010<br>• Added assembly elements<br>• Added physical asset elements<br>• Removed AnyType |
| V0600 | Aug 2012 | D. Brandl | Updated MESA Copyright |

## SCHEMA SCOPE

This document defines the information about production performance information that may be passed from manufacturing operations systems to business 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.

## Key Information Assumptions

The data represented in these schemas is derived from the UML model below. This model is defined in the ANSI/ISA 95.00.02-2010 standard. The information model in the figure below is hierarchical, and the assumption is that any production response information will always be within a contained production performance object. The Material Actual object is a replacement for the Material Produced Actual, Material Consumed Actual, and Consumable Actual objects.




Model of Exchanged Production Performance 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.

## ProductionPerformance

A production performance report is made up of a set of 1 or more production responses. The production performance also contains the information that defines the context of the report, such as start time, end time, location, and published date.

## ProductionResponse

Production responses are the response from manufacturing that is associated with a production Request. There may be one or more production responses for a single production request if the production facility needs to split the production request into smaller elements of work. For example a single production request for the production of “200 gears” may be reported on by 10 production response objects of “20 gears” each because of manufacturing restrictions.

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

## SegmentResponse

The production response for a specific segment of production is defined as a segment response. A segment response may be made up of zero or more sets of information on production data, personnel actual, equipment actual, materials consumed actual, materials produced actual, and consumables actual. A segment response may include an identification of the associated process segment,the actual starting and stopping time of the segment, and the duration of the segment.

A SegmentResponse is also included as an optional element in a ProductionRequest. In those cases the SegmentResponse defines elements that are to be returned with a ProductionResponse. In this use it basically defines a template of information to be filled in and returned. A segment response contains an element (*RequiredByRequestedSegmentResponse*) that is used in a ProductionSchedule to indicate if the including element is required or optional in a response from a request. The value of the RequiredByRequestedSegmentResponse element may be extended on an application specific basis.

NOTE: The SegmentResponse element (SegmentResponseType) is defined in the file:

B2MML-V0600-ProductionPerformanceTypes.xsd

## PersonnelActual

A personnel actual in a production response identifies a personnel resource by class ID or by instance ID used during the specified segment of production.

## EquipmentActual

An equipment actual in a production response identifies an equipment resource by class ID or instance ID used during the specified segment of production.

## PhysicalAssetActual

A physical asset actual in a production response identifies a physical asset resource by class ID or instance ID used during the specified segment of production.

## MaterialActual

A material produced, material consumed, or consumable materials are identified in a MaterialActual. This identifies a material resource by class ID, definition ID, Lot ID, and/or Sublot ID produced or consumed during the specified segment of production.

## MaterialProducedActual

A material produced actual in a production response identifies a material resource by class ID, definition ID, Lot ID, and/or Sublot ID produced during the specified segment of production.

Note: This element is included for backward compatibility. The MaterialActual should be used to specify material produced actuals.

## MaterialConsumedActual

A material consumed actual in a production response identifies a material resource by class ID, definition ID, Lot ID, and/or Sublot ID consumed during the specified segment of production.

Note: This element is included for backward compatibility. The MaterialActual should be used to specify material consumed actuals.

## ConsumableActual

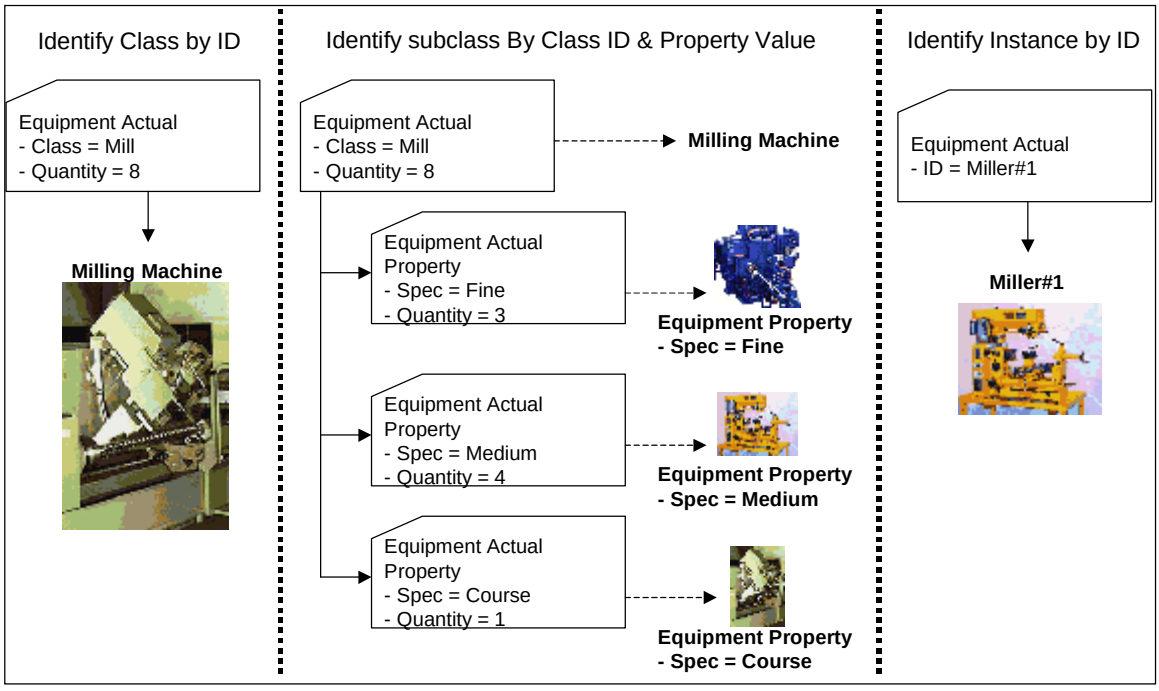
Consumable include resources that are not normally included in bills of materials or are not individually accounted for in specific production requests. Depending on the industry these may include water, catalysts, common chemicals, and utilities, such as electricity and steam. These items will often result in direct charges that will usually be considered in costing the product segment. Consumables are often materials that do have an inventory balance.

A consumables actual in a production response identifies a consumable material by class ID and/or definition ID consumed during the specified segment of production.

Note: This element is included for backward compatibility. The MaterialActual should be used to specify consumable actuals.

## Identifying Resources

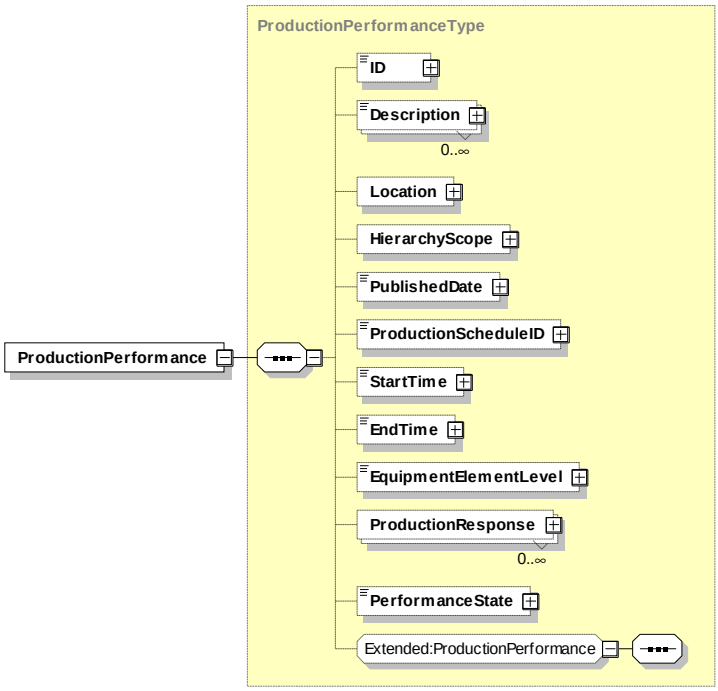
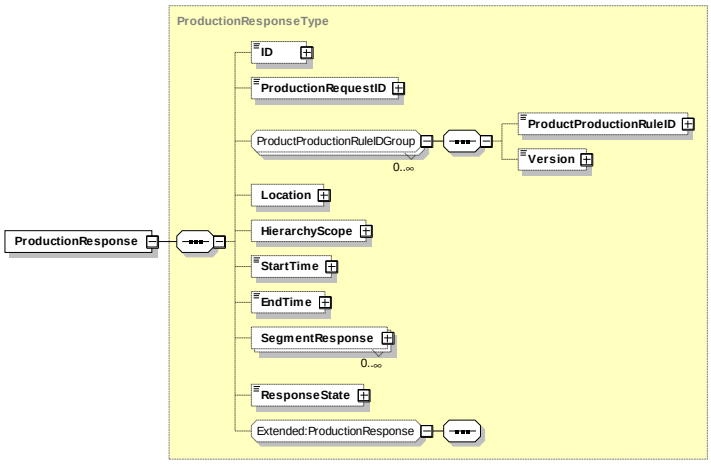
The schemas follow the ANSI/ISA-95 standard by defining resources by class ID or instance ID, or by defining them by class ID and a property value that is used to define a subset of the resource. For example, the figure below illustrates that a segment may require a certain number of milling machine, an equipment class. Other segments may require a subset of milling machine, such as “Fine” milling machines only. In the first case the class name, “Mill”, is sufficient to identify the resource required. In the second case the class name, “Mill”, and property name and value, “Spec” and “Fine”, define the required resource. Alternately a specific resource may be identified in a production performance report, such as specifying an actual milling machine with ID=”Miller#1”.

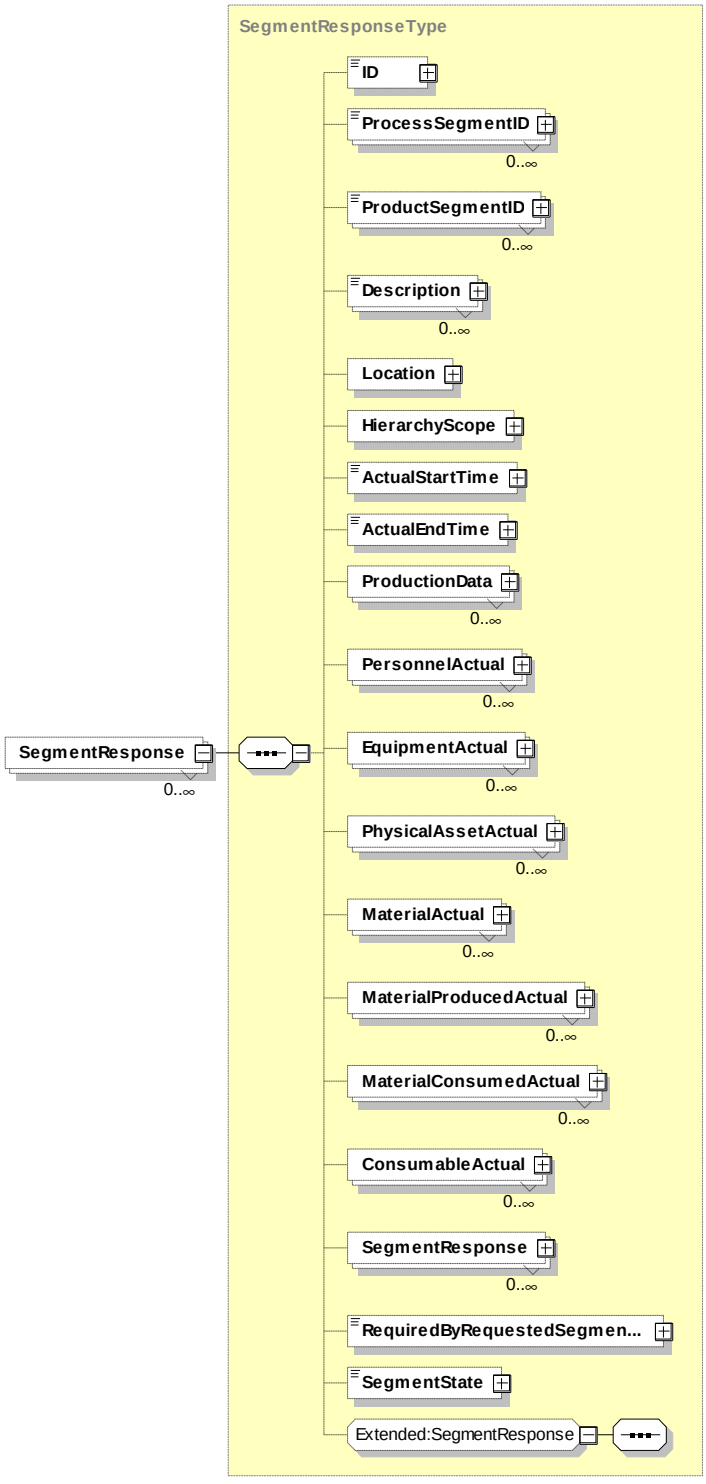


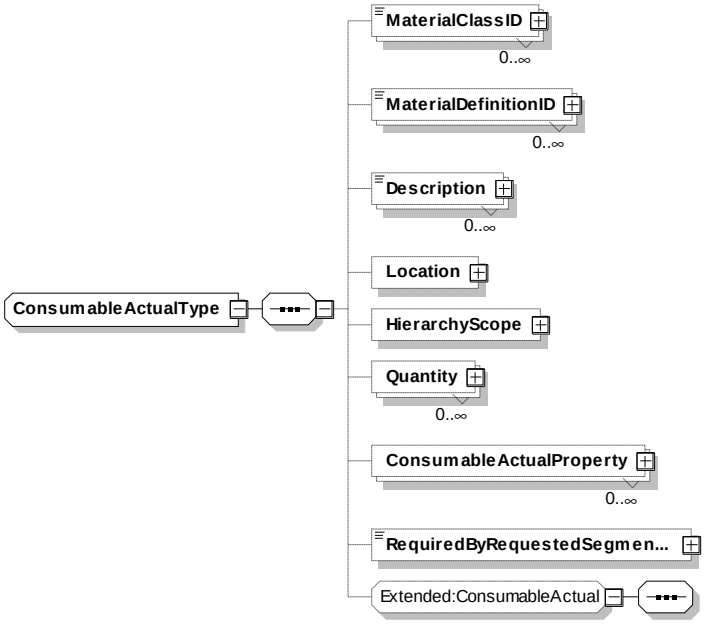
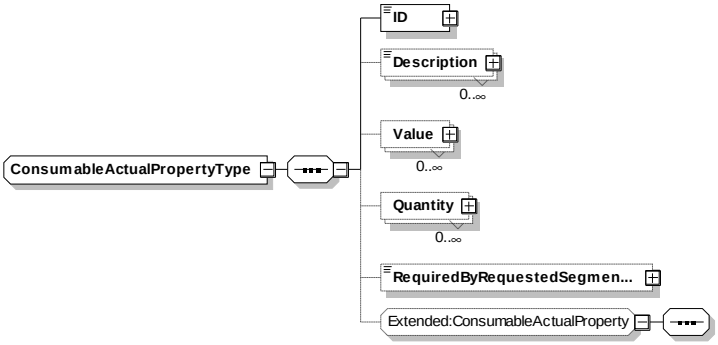

## Use within A Production Schedule

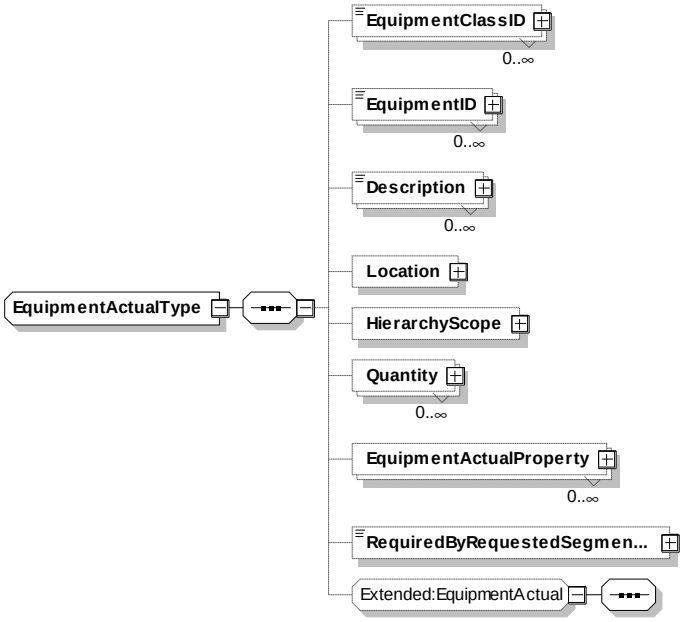
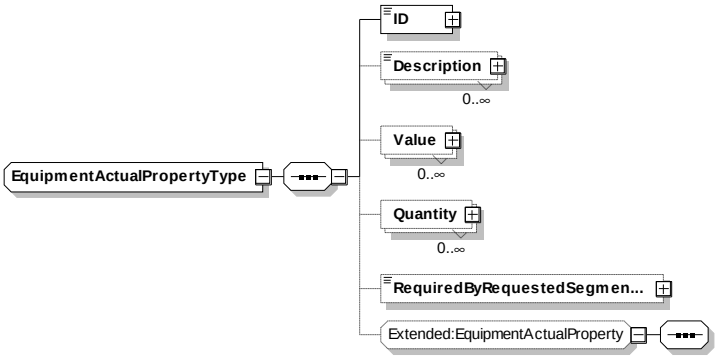
The *SegmentResponseType* is also used in a production schedule to define the requested segment response for a segment of production. This defines the structure and elements to be returned as a response for the production schedule. The *RequestedBySegmentResponse* attribute is used to indicate if the element is a required or optional element in a response.

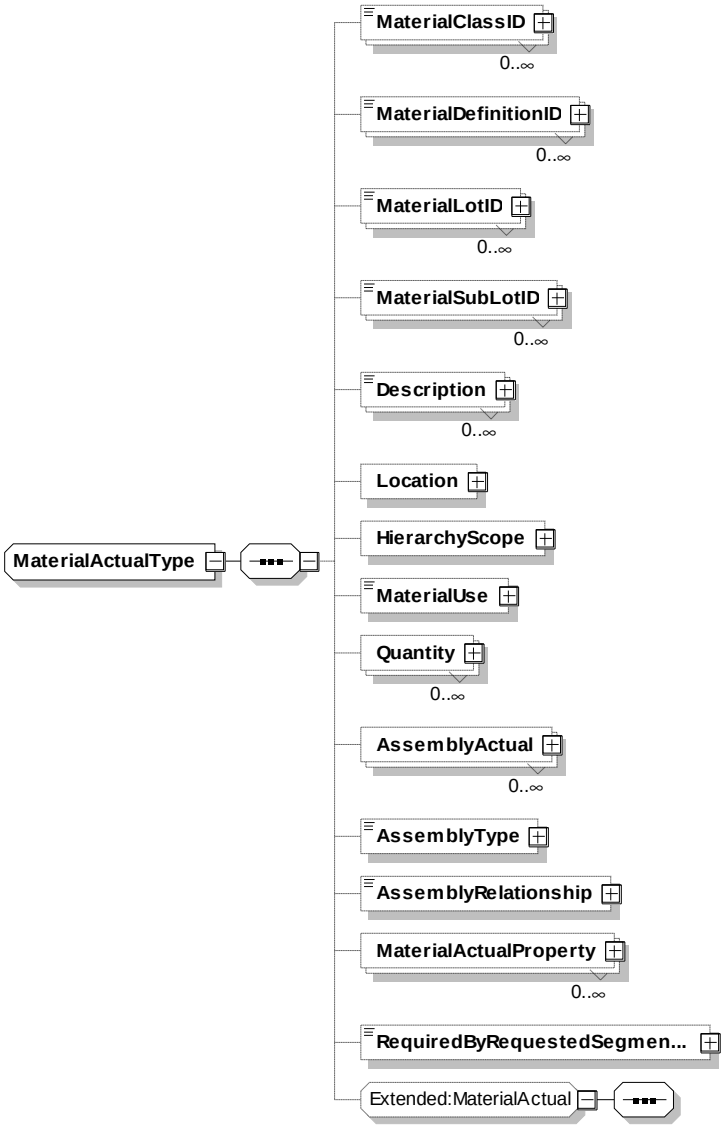
# ELEMENT DEFINITIONS

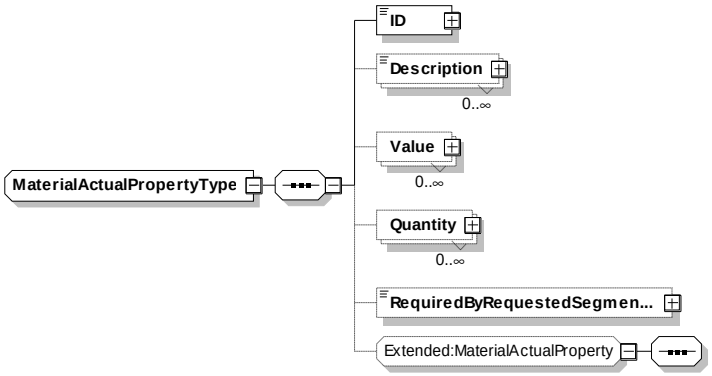
| Element/Type | Description |
|---|---|
| ProductionPerformance<br>***ProductionPerformanceType*** | The top level element. Contains a definition of a report on production performance, including the location of the performance, the publication data of the performance report, the ID of the associated production schedule, the duration of the production performance, and the list of production responses making up the production performance report. May include application specific defined elements.<br>  |
| ProductionResponse<br>***ProductionResponseType*** | Contains a definition of a production response report, including the identification of an associated production request, the product produced, the duration of the report, and the segments making up the production response. May include application specific defined elements. May be a top level element for defined locations.<br>  |

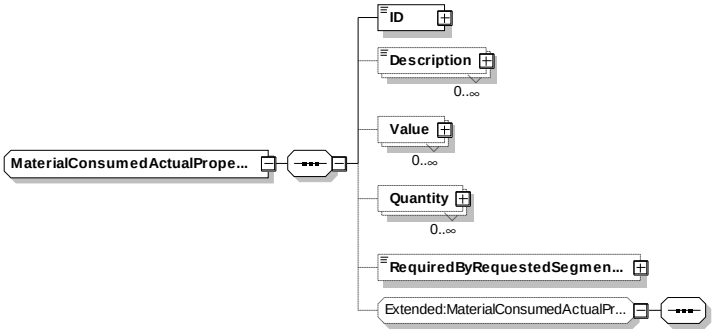
| Element/Type | Description |
|---|---|
| SegmentResponse<br>***SegmentResponseType*** | Contains a definition of a report on a segment. Includes the duration, production data, personnel, equipment, material produced, material consumed, and consumables used.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is included as part of a production schedule schema.]<br>  |

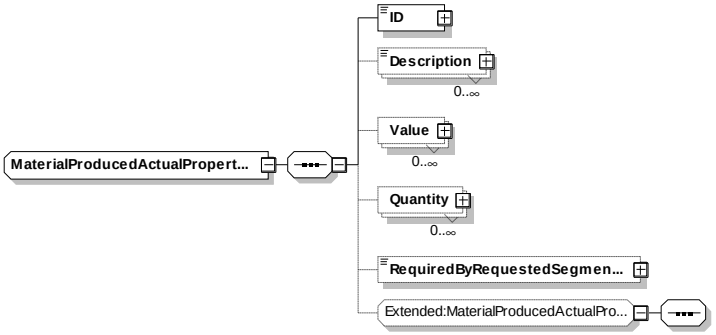
| Element/Type | Description |
|---|---|
| ConsumableActual<br>***ConsumableActualType*** | Contains a report on actual consumable materials used. May define the quantity of the consumable used, the location the consumable was obtained from, or may contain a list of property definitions and quantities for each property subset.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is included as part of a production schedule schema.]<br>  <br>*Note: This element is included for backward compatibility. The MaterialActual should be used to specify material requirements.* |
| ConsumableActualProperty<br>***ConsumableActualPropertyType*** | *Contains a definition of actual consumable materials used, for a subset of the resource identified by a property value. Includes the quantity of the consumable used.*<br>*[Note: The RequiredByRequestedSegmentResponse element is only used when this is included as part of a production schedule schema.]*<br>  <br>*Note: This element is included for backward compatibility.* |

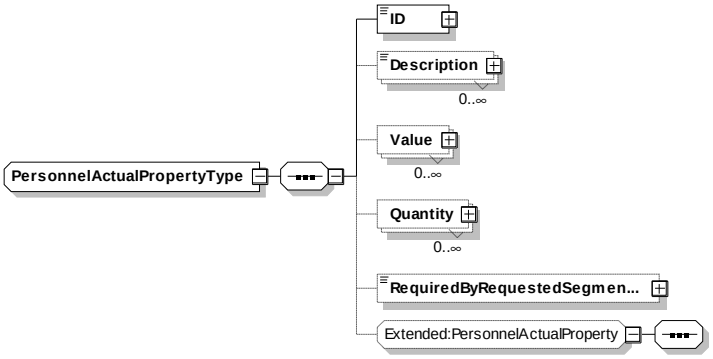
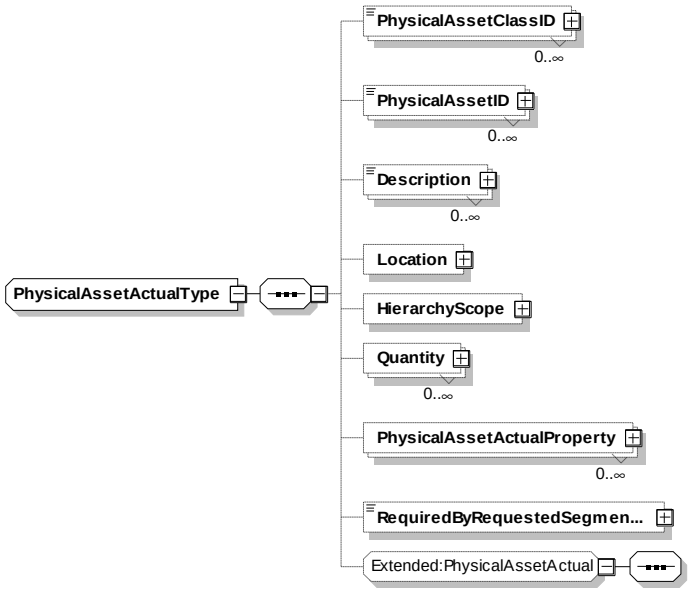
| Element/Type | Description |
|---|---|
| EquipmentActual<br>***EquipmentActualType*** | Contains a report on actual equipment resources used. May define the quantity of the resource used, or may contain a list of property definitions and quantities for each property subset.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |
| EquipmentActualProperty<br>***EquipmentActualPropertyType*** | Contains a definition of actual equipment resources used, for a subset of the resource identified by a property value. Includes the quantity of the resources used.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |

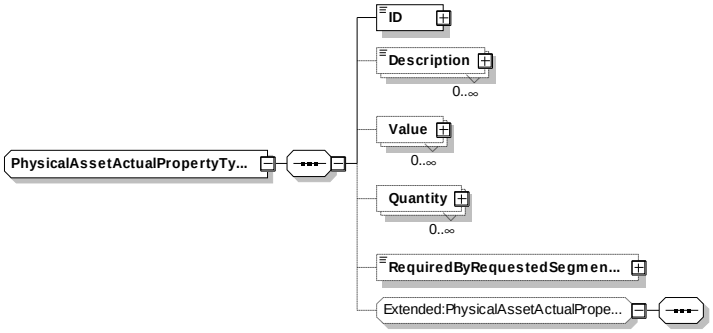
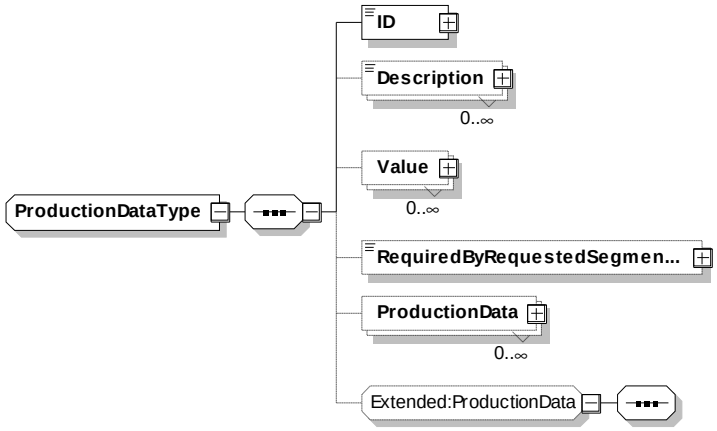
| Element/Type | Description |
|---|---|
| MaterialActual<br>***MaterialActualType*** | Contains a report on actual material resources used. May define the quantity of the material, or may contain a list of property definitions and quantities for each property subset.<br>A **MaterialActual** element may have a set of contained **AssemblyActual** elements to support hierarchical manufacturing bills.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |

| Element/Type | Description |
|---|---|
| MaterialActualProperty<br>***MaterialActualPropertyType*** | Contains a definition of actual material resources used, for a subset of the resource identified by a property value. Includes the quantity of the resource used.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |
| MaterialConsumedActual<br>***MaterialConsumedActualType*** | Contains a report on actual material resources consumed. May define the quantity of the resource consumed, or may contain a list of property definitions and quantities for each property subset.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  <br>*Note: This element is included for backward compatibility. The MaterialActual should be used to specify material requirements.* |

| Element/Type | Description |
|---|---|
| MaterialConsumedActualProperty<br>***MaterialConsumedActualPropertyType*** | Contains a definition of actual material resources consumed, for a subset of the resource identified by a property value. Includes the quantity of the resource consumed.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  <br>*Note: This element is included for backward compatibility.* |
| MaterialProducedActual<br>***MaterialProducedActualType*** | Contains a report on actual material resources produced. May define the quantity of the resource produced, or may contain a list of property definitions and quantities for each property subset.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  <br>*Note: This element is included for backward compatibility. The MaterialActual should be used to specify material requirements.* |

| Element/Type | Description |
|---|---|
| MaterialProducedActualProperty<br>***MaterialProducedActualPropertyType*** | Contains a definition of actual materials produced, for a subset of the materials identified by a property value. Includes the quantity of the resource produced.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  <br>*Note: This element is included for backward compatibility.* |
| PersonnelActual<br>***PersonnelActualType*** | Contains a report on actual personnel resources used. May define the quantity of the resource used, or may contain a list of property definitions and quantities for each property subset.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |

| Element/Type | Description |
|---|---|
| PersonnelActualProperty<br>***PersonnelActualPropertyType*** | Contains a definition of actual personnel resources used, for a subset of the resource identified by a property value. Includes the quantity of the resources used.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |
| PhysicalAssetActual<br>***PhysicalAssetActualType*** | Contains a report on actual physical asset resources used. May define the quantity of the resource used, or may contain a list of property definitions and quantities for each property subset.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |

| Element/Type | Description |
|---|---|
| PhysicalAssetActualProperty<br>***PhysicalAssetActualPropertyType*** | Contains a definition of actual physical asset resources used, for a subset of the resource identified by a property value. Includes the quantity of the resources used.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is part of a production schedule schema.]<br>  |
| ProductionData<br>***ProductionDataType*** | Contains a definition of a production data element, corresponding to a process segment or product segment parameter. Includes the ID of the parameter and the value for the parameter.<br>[Note: The RequiredByRequestedSegmentResponse element is only used when this is included as part of a production schedule schema.]<br>  |

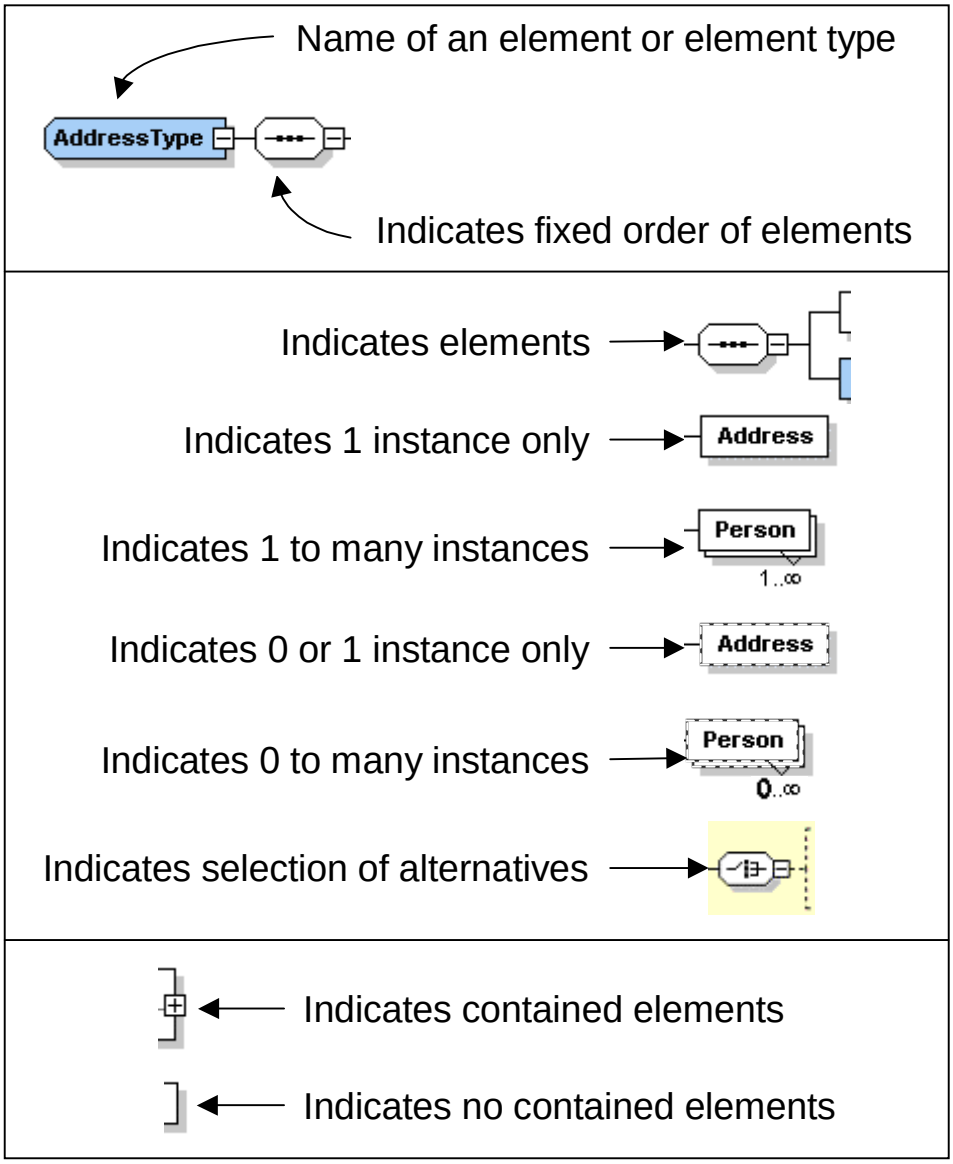
## TRANSACTION ELEMENTS

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.

| Production Performance Elements | Description |
|---|---|
| GetProductionPerformance | Get *ProductionPerformance* definition. |
| ShowProductionPerformance | Returned information from the *GetProductionPerformance* message. |
| ProcessProductionPerformance | Process *ProductionPerformance* definition. |
| AcknowledgeProductionPerformance | Returned status from the *ProcessProductionPerformance* message. |
| ChangeProductionPerformance | Change *ProductionPerformance* definition. |
| RespondProductionPerformance | Returned status from the *ChangeProductionPerformance* message. |
| CancelProductionPerformance | Cancel *ProductionPerformance* definition. |
| SyncProductionPerformance | Published *ProductionPerformance* definition. |

## 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.




About MESA: MESA promotes the exchange of best practices, strategies and innovation in managing manufacturing operations and in achieving operations excellence. MESA's industry events, symposiums, and publications help manufacturers achieve manufacturing leadership by deploying practical solutions that combine information, business, manufacturing and supply chain processes and technologies. Visit us online at http://www.mesa.org.

About the XML Committee: The XML Committe was formed within MESA to provide a forum for the development of the B2MML and BatchML specifications.