

# **Definition of CRMSurv 1.1**

Version: 1.1

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# Introduction

## Scope

### 1.1 Introduction

#### 1.1.1 Scope

This document presents CRMsurv, an extension of CIDOC CRM created a) to support the archaeological survey process and various entities and activities typically related to it, and b) to facilitate the mapping of existing survey documentation to a common, scientific and standard data representation. The model has been created starting from an analysis of existing data and metadata from a set of current and legacy survey projects conducted since the 1950s in central Italy, and enriched by continuous collaboration with various communities of archaeologists from different countries and schools around the northern Mediterranean [2, 3].

CRMsurv intends to provide all necessary tools to manage and integrate existing documentation in order to formalize knowledge extracted from observations made by archaeologists, recorded in various ways and adopting different standards [1]. In this sense, its purpose is to facilitate the semantic encoding, exchange, interoperability and access of existing archaeological documentation based on survey activities. It is based on an understanding of archaeological field survey as a systematic research activity aimed at collecting observations and portable materials from specified locations and areas on the earth's surface. The 'observations' part may include both direct observations and recordings of archaeological features, and anything deemed relevant to the process of observation itself, such as evidence for natural or anthropogenic processes affecting the preservation or detectability of archaeological remains or features before or during the survey process. The 'portable materials' part includes both details of the collection process itself, and of any subsequent processing, classification and interpretation stages that may take place either during or after the actual field survey.

The CRMsurv ontological model proper adds classes and properties to CIDOC CRM to allow the accurate representation of data regarding the survey event itself, the associated geodata, any archaeological sites and features encountered, and any other field observations; and data regarding the physical collections of portable artefacts made, any subgroupings of these, and individual artefacts.

Additionally, CRMSurv is deployed alongside a set of 16 ready-made semantic reference data models ("SEMAFORA SRDMs"), that provide guidance for the semantic description of the various 'branches' of the overall survey process, including various types of digital documentation; and of the persons, groups and institutions involved at various stages and in various capacities [4].

Adoption of CRMSurv and its related SRDMs will support archaeologists in determining the type, quantity and dating of the archaeological artefacts, features and sites present at the earth's surface during the time of the survey activity, at varying degrees of spatial and temporal resolution and forms the basis for any further analysis. Moreover, archaeologists can assess the process of data collection and interpretation itself because the model records where, when, how and by whom the primary survey data were generated, what factors were deemed to affect the quality of these data, and what physical and documentary evidence is available for further study.

One of the most important goals of the model is to overcome the differences resulting from the application of different survey techniques and procedures, e.g. from different traditions and schools of archaeology that have evolved over time, and to reveal the common ways of thinking that characterize systematic fieldwalking surveys. This will serve to provide a unified view that can express the common concepts without imposing any

specific recording or investigation technique and will also provide a sound basis for the integration of data generated by various methods.

From a technical point of view, the model provides conceptual descriptions of classes and properties in an encoding-agnostic formalism (this very specification document), inherited from CIDOC CRM, allowing implementation of its concepts and relationships by the use of various languages and formal encodings (such as RDF and OWL), thereby providing maximum flexibility for operations of mapping and conversion and giving IT experts the freedom to implement it in the way they prefer. The model is also offered in RDF format.

The scope of CRMsurv is limited to survey related questions. It makes no attempt to model the excavation process, which is the domain of the CRMarchaeo extension (<https://cidoc-crm.org/crmarchaeo/>). Its scope is limited to archaeological remains present at the earth's surface, including those circulating in the plough layer.

## 1.1.2 Status

CRMsurv is the result of the work of a small project team consisting of both archaeological survey and conceptual modeling experts, financially supported in its later stages by the Netherlands Organization for Scientific Research 'Open Science' scheme but building on a decade of international consultations among survey practitioners and data owners meeting regularly in the IMS workshops, and semantic modeling experts meeting at regular SIG meetings. The first need that the model attempts to meet is to create a common ground for the integration of archaeological survey records on every level, from raw survey data to official documentation produced according to national and institutional standards. However, in a broader sense, it is always open to any possible integration and addition that may become necessary as a result of its practical use on real archaeological problems on a large scale. The model is intended to be maintained and promoted as an international standard.

## 1.1.3 Naming Conventions

All the declared classes were given both a name and an identifier constructed according to the conventions used in the CIDOC CRM model. For classes, that identifier consists of the letter U followed by a number. Resulting properties were also given a name and an identifier, constructed according to the same conventions. That identifier consists of the letters UP followed by a number, which in turn is followed by the letter "i" every time the property is mentioned "backwards", i.e., from target to domain (inverse link). "U" and "UP" correspond respectively to letters "E" and "P" in the CIDOC CRM naming conventions, where "E" originally meant "entity" (although the CIDOC CRM "entities" are now consistently called "classes"), and "P" means "property". Whenever CIDOC CRM classes are used in our model, they are named by the name they have in the original CIDOC CRM.

## 1.1.4 References

- [1] de Haas, T & M van Leusen, in press. Digital Data Integration in Archaeology: an assessment of the status quo within Mediterranean Field Surveying. Leiden Archaeological Studies.
- [2] de Haas, TCA & PM van Leusen, 2020. FAIR survey: improving documentation and archiving practices in archaeological field survey through CIDOC CRM. FASTI Online Documents and Research 2020-12: <https://www.fastionline.org/docs/FOLDER-sur-2020-12.pdf>
- [3] Attema, PAJ, P Carafa, WM Jongman et al. 2021. The Roman Hinterland Project: integrating archaeological field surveys around Rome and beyond. European Journal of Archaeology 25(2): 238 - 258. DOI: <https://doi.org/10.1017/ea.2021.51>
- [4] Using semantic modeling to create FAIR open data for archaeological field survey: a showcase and toolkit (SEMAFORA). Zenodo community, <https://zenodo.org/communities/semafora/?page=1&size=20>

## **Status**

Published version

# **CRMSurv 1.1 class hierarchy, aligned with portions from the CRMsci version 1.2.3, CRMdig version 3.2.1, CRMarchaeo version 1.4.1, CIDOC CRM version 6.2 and the CIDOC CRM class hierarchies**

This class hierarchy lists:

- all classes declared in CRMSurv 1.1
- all classes declared in CIDOC CRM version 6.2 that are declared as superclasses of classes declared in the CRMSurv 1.1
- all classes declared in CRMsci version 1.2.3 version 1.2.3 that are declared as superclasses of classes declared in the CRMSurv 1.1
- all classes declared in CRMdig version 3.2.1 version 3.2.1 that are declared as superclasses of classes declared in the CRMSurv 1.1
- all classes declared in CRMarchaeo version 1.4.1 version 1.4.1 that are declared as superclasses of classes declared in the CRMSurv 1.1
- all classes declared in CIDOC CRM version 6.2 that are either domain or range for a property declared in the CRMSurv 1.1
- all classes declared in CRMsci version 1.2.3 version 1.2.3 that are either domain or range for a property declared in the CRMSurv 1.1
- all classes declared in CRMdig version 3.2.1 version 3.2.1 that are either domain or range for a property declared in the CRMSurv 1.1
- all classes declared in CRMarchaeo version 1.4.1 version 1.4.1 that are either domain or range for a property declared in the CRMSurv 1.1

*Table 1: Class Hierarchy*

S13	Sample	
U6	-	Material Sample
S19	Encounter Event	
U5	-	Digitization Process Unit
U3	-	Survey Process Unit
U2	-	Survey Collection Activity
S2	Sample Taking	
U2	-	Survey Collection Activity
S20	Physical Feature	
U4	-	Survey Surface Unit
E18	Physical Thing	
U6	-	Material Sample
E55	Type	
U11	-	Vessel Part
U10	-	Shape
U9	-	Ware
U8	-	Function
U7	-	Fabric
E7	Activity	
U1	-	Archaeological Survey
D2	Digitization Process	
U5	-	Digitization Process Unit

## List of external classes used in CRMSurv 1.1

*Table 2: List of external classes grouped by model and ordered by model (exception: CRMbase always goes first) and then by class identifier.*

Class identifier	Class name	Model	Version
E7	Activity	CIDOC CRM	6.2
E18	Physical Thing	CIDOC CRM	6.2
E55	Type	CIDOC CRM	6.2
D2	Digitization Process	CRMdig: An Extension of CIDOC CRM to support provenance metadata	3.2.1



S2	Sample Taking	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3
S4	Observation	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3
S13	Sample	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3
S19	Encounter Event	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3
S20	Physical Feature	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3

# **CRMSurv 1.1 property hierarchy, aligned with portions from the CRMsci version 1.2.3, CRMdig version 3.2.1, CRMarchaeo version 1.4.1, CIDOC CRM version 6.2 and the CIDOC CRM property hierarchies**

This property hierarchy lists:

- all properties declared in CRMSurv 1.1
- all properties declared in CIDOC CRM version 6.2 that are declared as superproperties of properties declared in the CRMSurv 1.1
- all properties declared in CRMsci version 1.2.3 version 1.2.3 that are declared as superproperties of properties declared in the CRMSurv 1.1
- all properties declared in CRMdig version 3.2.1 version 3.2.1 that are declared as superproperties of properties declared in the CRMSurv 1.1
- all properties declared in CRMarchaeo version 1.4.1 version 1.4.1 that are declared as superproperties of properties declared in the CRMSurv 1.1

*Table 3: Property Hierarchy*

<b>Property id</b>	<b>Property Name</b>	<b>Entity – Domain</b>	<b>Entity - Range</b>
O5	removed (was removed by)	S2 Sample Taking	S13 Sample
UP3	- collected (was collected by)	U2 Survey Collection Activity	U6 Material Sample
O19	has found object (was object found by)	S19 Encounter Event	E18 Physical Thing
UP2	- surveyed (was surveyed by)	U3 Survey Process Unit	U4 Survey Surface Unit

## **List of external properties used in CRMSurv 1.1**

*Table 4: List of external properties grouped by model and ordered by model and then by property identifier.*

O5	removed (was removed by)	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3
O19	has found object (was object found by)	CRMsci: An Extension of CIDOC CRM to support scientific observation	1.2.3

# CRMSurv 1.1 Class Declarations

The classes are comprehensively declared in this section using the following format:

- Class names are presented as headings in bold face, preceded by the class' unique identifier;
- The line "Subclass of:" declares the superclass of the class from which it inherits properties;
- The line "Superclass of:" is a cross-reference to the subclasses of this class;
- The line "Scope note:" contains the textual definition of the concept the class represents;
- The line "Examples:" contains a bulleted list of examples of instances of this class.
- The line "Properties:" declares the list of the class's properties;
- Each property is represented by its unique identifier, its forward name and the range class that it links to, separated by colons;
- Inherited properties are not represented;

## U1 Archaeological Survey

### Subclass of:

E7 Activity

### Scope note:

This class comprises any coherent set of systematic research activities aimed at recording the presence and properties of material archaeological remains present at the earth's surface, by means of direct observation in the field.

Archaeological surveys are characterised by coherence in time (they consist of a single campaign or season of field research), aims and goals (as defined by the Institution carrying it out), methods, and geographic scope (study area). For example, a University may run a 4-year project to conduct systematic intensive surveys in the hinterland of a specific Roman town, aiming to record all activities relating to agricultural land use. Each field season within such a project forms one instance of U1 Archaeological Survey

An archaeological survey (U1) consists of multiple consecutive investigations of land plots, instances of U4 Surface Survey Units, involving the making of field observations, the collection of archaeological materials, and/or the subsequent processing of those materials, according to a standard set of protocols.

While the particular circumstances of the start and end of an archaeological survey vary by case, an instance can typically be said to have come into existence upon the start of the first survey activity and covers the immediate activities associated with the survey such as fieldwalking and preliminary material studies. It ends upon the end of the last survey activity. All publication activities and scientific analyses that may be involved to better understand the results of the survey

activities are a part of the overall Project (PE35) constituted for specific research objectives, and not part of the archaeological survey. An instance of PE35 can consist of one or multiple instances of U1 Archaeological Survey but may also involve instances of A9 Archaeological Excavation as well as other activities.

**Examples:**

The survey (U1) of the small islands around Paros during 2019 as a part of the SCIP Project (PE35).

The 1975 field season (U1) of the Biferno Valley Survey (PE35).

**In First Order Logic:**

$U1(x) \Rightarrow E7(x)$

## **U2 Survey Collection Activity**

**Subclass of:**

S2 Sample Taking

S19 Encounter Event

**Scope note:**

This class comprises the collection of archaeologically relevant objects from a land plot. In the context of systematic survey practices, instances of Survey Collection Activity take place at an U4 Surface Survey Unit during and as a part of an U3 Survey Process Unit, usually but not necessarily following an established protocol. This involves the collection of human-made objects such as pottery, metal objects, lithics, etc. but can also include natural objects such as unworked stones without any specific analytical value that are later discovered to be irrelevant and typically discarded from the collection.

An instance of Survey Collection Activity comes into existence upon the intentional removal of parts of the Survey Surface Unit observable on the ground. The Survey Collection Activity ends when the last artefact or a physical object from the specific Survey Surface Unit or Site has been picked up from the ground, recorded, and typically inserted into a container with the rest of the finds from the same unit or site.

**Examples:**

The collection of all artefacts from unit 2986 on July 27th [during the Raganello archaeological Survey project].

The collection of the bag of diagnostic artefacts during the visit of the lower town near the Palace of Nestor on 13th may 1967 by the Pylos Survey Project

**In First Order Logic:**

$U2(x) \Rightarrow S2(x)$

$U2(x) \Rightarrow S19(x)$

**Properties:**

UP3 collected (was collected by): U6 Material Sample

## U3 Survey Process Unit

**Subclass of:**

S19 Encounter Event

**Scope note:**

This class comprises acts of investigation, as part of an archaeological survey, that observe a single, discrete land plot during a single continuous time period (or 'visit'), according to an established protocol. This may include the recording of Survey Surface Unit (U4) properties and physical features and the making of observations by field walkers. It does not inherently include the collection of artefacts. In case an instance of U3 Survey Process Unit entails such activities, these should be modelled with Survey Collection Activity (U2) and related to the overall U3 Survey Process Unit as follows:

U4 Survey Surface Unit -> UP2i was surveyed by -> U3 Survey Process Unit -> P9 consists of -> U2 Survey Collection Activity -> UP3 collected -> U6 Material Sample

An instance of Survey Process Unit (U3) comes into existence when individuals enter into the act of investigating a particular defined Survey Surface Unit (U4) following the assigned plan. The instance of survey process unit is on-going so long as the investigation continues at the specified survey surface unit. The activity comes to an end when the investigation has closed in accordance with the plan or is interrupted by any event that impedes its completion (e.g.: weather conditions, conflict with land owners, health conditions, etc.)

**Examples:**

The surveying, by team A on 7 juli 2005, of unit 2986 of the Raganello Archaeological Survey project.

The visit of the Lower Town near the Palace of Nestor on 13th May 1967 by the Pylos Survey Project.

**In First Order Logic:**
$$U3(x) \Rightarrow S19(x)$$
**Properties:**

UP2 surveyed (was surveyed by): U4 Survey Surface Unit

## U4 Survey Surface Unit

**Subclass of:**

S20 Physical Feature

**Scope note:**

This class comprises single land plots with artificially or physically defined boundaries that are the object of investigation in an Archaeological Survey (U1). Plots can be defined by imposing a geographical grid that ignores the landscape, or by following existing land use or land cover; their geometry can be point-, line, or polygon-based depending on the survey design. Typical nouns used to describe this class are tracts, units, walker lines. The substance of a Survey Surface Unit is a material physical feature on the Earth with a specified boundary.

Instances of Survey Surface Unit come into existence [see note below] through their designation in an official survey surface registration system. They continue to exist so long as the material physical feature designated continues to exist in substantially the same place and form and the boundary indicators for these plots can be recalled through some medium (physical, digital, memory). A Survey Surface Unit ceases to exist when it is sufficiently degraded so that it no longer bears a material or spatial continuity with its original designation or if the designating information is lost. For example, when it has been substantially altered or removed by fluvial erosion, quarrying, etc. or there remain no records that allow the re-identification of the land plots on the surface of the earth.

Survey Surface Units are typically designed to help the identification of archaeological sites and/or the mapping of the archaeological landscape as a continuum.

A note concerning the relation between a site, in the colloquial sense, an instance of survey surface unit U4, and the CRM class E27 Site:

What archaeologists regard as a 'site' is modelled as a type of E27 Site. An E27 Site as a physical feature exists objectively in the world with or without our knowledge of it, but comes to be declared an 'archaeological site' as a result of archaeological surveys or similar practices. This would typically be documented through the p2 has type E55 relation using a vocabulary term for archaeological site. One 'site' may be covered by and consist of one or many instances of U4 Survey Surface Units and one instance of U4 Survey Surface Unit can contain one or many archaeological sites. Once declared as archaeological, a site may itself be considered also to be an U4 and thus be visited directly via a Survey Process Unit.

**Note:** Of course being physical objects they preexist their being named or recognized by human beings. Their existence in a physical sense as a certain conglomeration of matter in space and time is not dependent on the existence of human beings. But once named and defined by a human group the physical substance now supports an additional identity that it did not have before which nonetheless has physically objective and findable properties. It is in this way that the object qua (as) survey unit comes to be although regarding its substance as matter that matter was already in existence yet without the attribution of an identity relative to a survey.

**Examples:**

Unit 2986 of the Raganello Archaeological Survey project

Tract 148 of the Zakynthos Survey

Point-sample 842 of the Riu Mannu survey

**In First Order Logic:**

$U4(x) \Rightarrow S20(x)$

## **U5 Digitization Process Unit**

**Subclass of:**

D2 Digitization Process

S19 Encounter Event

**Scope note:**

This class comprises digital registration activities of properties of physical things using specialised equipment designed to capture physical signals from objects using sensors and record them as usable / interpretable digital outputs with specific set parameters, which typically affect the output and the interpretation of the results of the digital recording. The objects of registration / investigation typically include anthropogenic or natural features of the earth's surface. An instance of digital registration involves the interaction of a sensor in the digital device, a physical thing measured and a digital object output which encodes certain properties of that object at the time of registration. Digital Process Units should be used to record digital measurement activities which have quantifiable outputs from mechanical inputs of signals which are carried out towards the end of having a scientifically evaluatable measurement output. Therefore, someone sketching an object, typing an observation in a note on a tablet etc ARE NOT instance of Digital Process Unit because they do not use sensors from a machine that automatically capture signals from a physical reality and transfer them into a digital form that can be used to interpret that reality based on knowledge of interpretation of the relevant signal and the physics etc. that are relevant for interpreting it.

An instance of digital process unit comes into existence on the commencement of the registration procedure and is on-going so long as the operators were engaged in the purposeful action to produce a particular dataset. The instance of digital process unit ends upon successful execution of



the registration process or abnormally if the registration is fatally interrupted by an incidental condition or the general abandonment of the process by the actors engaged in the registration.

Typical kinds of digital process unit include LIDAR scanning, photogrammetry, spatial recording via Total Station or drone inter alia.

**Examples:**

The colour-calibrated photographing of the objects in material sample 1101.01 from the Raganello Basin Survey.

The LIDAR scanning session of the surface of area 1 of survey project SCIP.

**In First Order Logic:**

$U5(x) \Rightarrow D2(x)$

$U5(x) \Rightarrow S19(x)$

## U6 Material Sample

**Subclass of:**

E18 Physical Thing

S13 Sample

**Scope note:**

This class comprises one or more archaeologically relevant objects, such as fragments of pottery, lithics, etcetera, typically collected from a Survey Surface Unit (U4) in an instance of Survey Collection Activity (U2). The material sample is considered potentially indicative of aspects of the identified material substantial from which they have been removed, providing information regarding its past use, material makeup etc. The substance of the material sample is one or more material objects that have a designated provenience from a particular physical area.

Instances of U6 Material Sample come into being upon the successful completion of a U2 Survey Collection Activity, and may later be differentiated into notional or physical collections of objects on the basis of further classification activities. For example, the material sample originating in a particular U2 Survey Collection Activity can be classified into material classes, ware types, fabric group etcetera. These can, but do not necessarily have to be physically separated and stored separately from each other. Instance of U6 Material Sample cease to exist when they are intentionally discarded or when it is no longer possible to reconstitute them from their constituent parts (e.g., when objects are removed from their container without retaining their provenience).

**Examples:**

A bag containing sample 1011.01 from the Raganello Basin Survey

A bag containing the feature sherds from sample 1011.01 from the Raganello Basin Survey

The African Red Slip ware objects contained in sample 1011.01 from the Raganello Basin Survey

**In First Order Logic:**

$U6(x) \Rightarrow E18(x)$

$U6(x) \Rightarrow S13(x)$

## U7 Fabric

**Subclass of:**

E55 Type

**Scope note:**

This class comprises types of groupings of pottery as established by appropriate experts on the basis of visual macro- and/or microscopic inspection of clay matrices and inclusions. Fabric group types are declared in order to reflect characteristics of the raw materials used as well as the manufacturing procedures adopted for the creation of groups of pottery materials. A pottery fabric type can therefore potentially be tied to specific production locations. Actual instances of clay matrices used to establish the declaration of an instance of U7 Fabric may be modified by post-depositional processes, which can introduce uncertainty into the type assignment of an instance of this class to a particular object. The substance of an instance of U7 Fabric is a conceptual classification created for scientific analysis.

An instance of Fabric comes into being upon its declaration and continues to exist thereafter even if disproven or superseded, so long as it remains an object of discourse in scientific literature.

**Examples:**

Segni Survey fabric 18

Campanian 'Black Sand' fabric as defined in <https://doi.org/10.5284/1028192>  
([https://archaeologydataservice.ac.uk/archives/view/amphora\\_ahrb\\_2005/cat\\_fab.cfm](https://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_fab.cfm))

**In First Order Logic:**

$U7(x) \Rightarrow E55(x)$

## U8 Function

**Subclass of:**

## E55 Type

### Scope note:

This class comprises types of groupings of objects according to their presumed function as determined by appropriate experts on the basis of that group of objects' shape, fabric and other properties. Instance of U8 Function typologic groupings are often arranged hierarchically organizing, for example, 'baking trays' and 'cooking pots' under 'kitchen ware'. An individual real world object may have multiple functions; a particular amphora, for example, may be used for transportation and for storage. Following transformation, it may have had secondary functions: for example, a storage vessel sherd may be re-used as an ostrakon. The substance of an instance of U8 Function is a conceptual classification created for scientific analysis.

An instance of U8 Function comes into being upon its declaration and continues to exist thereafter even if disproven or superseded, so long as it remains an object of discourse in scientific literature.

### Examples:

Storage

Cooking

Architectural element

### In First Order Logic:

$U8(x) \Rightarrow E55(x)$

## U9 Ware

### Subclass of:

E55 Type

### Scope note:

This class comprises types of groupings of ceramic objects (pottery, terracottas and building materials) organized according to their visual characteristics as determined by appropriate experts on the basis of that group of objects' combined compositional characteristics (U7 fabric) and manufacturing techniques (slip, finish, use of potter's wheel). In addition, instances of U9 Ware are often characterised by a specific suite of U10 shapes. Ware groupings are often specified hierarchically (e.g. African Red Slip Ware may be subdivided into ware groups A, B, C and D). The classification of an individual real world object according to an instance of U9 Ware depends to varying degrees on different aspects of that object; for example, "black gloss ware" is attributed solely on the basis of a real world object's dark slipped surface, whereas "impasto chiaro sabbioso" is attributed to an object on the basis of its typical colour and inclusions (e.g. its fabric). The substance of an instance of Ware is a conceptual classification created for scientific analysis.

An instance of U9 Ware comes into being upon its declaration and continues to exist thereafter even if disproven or superseded, so long as it remains an object of discourse in scientific literature.

**Examples:**

Black Gloss ware as defined by the Getty Art and Architecture Thesaurus online  
([https://www.getty.edu/vow/AATFullDisplay?find=ware&logic=AND&note=&english=N&prev\\_page=1&subjectid=300387491](https://www.getty.edu/vow/AATFullDisplay?find=ware&logic=AND&note=&english=N&prev_page=1&subjectid=300387491))

Internal slipped ware (a subgroup of coarse wares)

**In First Order Logic:**

$U9(x) \Rightarrow E55(x)$

## U10 Shape

**Subclass of:**

E55 Type

**Scope note:**

This class comprises types of groupings of specific ceramic forms that can be declared by appropriate experts in order to categorise individual objects, fragmented or not. An instance of U10 Shape is declared based on the morphological characteristics (curvature, thickness, position and type of decoration) of an ideal object deduced either from many typical real world objects or reconstructed from knowledge of vessel parts when intact exemplars do not exist or are insufficient to ground the positing of an instance of U10 Shape. Shape groupings are often arranged hierarchically, for example grouping 'one-handled cups' and 'large cups' can be declared under 'cups', or 'cups' and 'bowls' under open vessels. Different shapes are more or less readily identified. For example, in some cases simple wall fragments can be assigned the shape 'dolium' based on their thickness, while in other cases rim or base fragments of a very specific shape can potentially belong to different shapes (e.g., a jug or jar, cup or bowl). The substance of an instance of U10 Shape is a conceptual classification created for scientific analysis.

An instance of Shape comes into being upon its declaration and continues to exist thereafter even if disproven or superseded, so long as it remains an object of discourse in scientific literature.

**Examples:**

Amphora

Cup

Jar

**In First Order Logic:**

$$U10(x) \Rightarrow E55(x)$$

## U11 Vessel Part

**Subclass of:**

E55 Type

**Scope note:**

This class comprises internationally agreed types of vessel parts that can be declared in the abstract and can be assigned by appropriate experts to individual objects, fragmented or not, in order to identify their parthood status within the context of an overall vessel. The attribution of an instance of U11 Vessel Part to an individual real world object is based on the morphological characteristics (curvature, thickness, surface finish) of that object and may aid in the identification of an overall vessel shape (U10). Vessel part groupings are typically organized hierarchically, for example grouping 'ring bases' and 'flat bases' under 'bases'. The substance of an instance of Vessel Part is a conceptual classification created for scientific analysis.

An instance of U11 Shape comes into being upon its declaration and continues to exist thereafter even if disproven or superseded, so long as it remains an object of discourse in scientific literature.

**Examples:**

Base

Shoulder, as defined by the Getty Arts and Architecture Thesaurus online:

[https://www.getty.edu/vow/AATFullDisplay?find=shoulder&logic=AND&note=&english=N&prev\\_page=1&subjectid=300203465](https://www.getty.edu/vow/AATFullDisplay?find=shoulder&logic=AND&note=&english=N&prev_page=1&subjectid=300203465)

Rim

**In First Order Logic:**

$$U11(x) \Rightarrow E55(x)$$

# CRMSurv 1.1 Property Declarations

The properties are comprehensively declared in this section using the following format:

- Property names are presented as headings in bold face, preceded by unique property identifiers;
- The line “Domain:” declares the class for which the property is defined;
- The line “Range:” declares the class to which the property points, or that provides the values for the property;
- The line “Superproperty of:” is a cross-reference to any subproperties the property may have;
- The line “Quantification:” declares the possible number of occurrences for domain and range class instances for the property. Possible values are: one to many, many to many, many to one. Quantifications are presented in UML format and in ER format (used by the CIDOC CRM);
- The line “Scope note:” contains the textual definition of the concept the property represents;
- The line “Examples:” contains a bulleted list of examples of instances of this property.

## **UP1 has observation affecting parameter (is observation affecting parameter for)**

### **Domain:**

S4 Observation

### **Range:**

E55 Type

### **Scope note:**

This property describes the effects of some classified category of affective parameter, documented as an instance of E55, on an instance of S4 Observation. It describes how different parameters (such as vegetation cover, sunlight, ..) affect the quality of different kinds of observations made during an instance of S4 Observation.

### **Examples:**

The medium vegetation cover observed during the surveying of unit 2004 of the Nettuno Survey

The overall visibility on the site of Ad Medias estimated at 90% during the initial survey by the PRP in 2012.

**In First Order Logic:**

$UP1(x,y) \Rightarrow S4(x)$

$UP1(x,y) \Rightarrow E55(y)$

## **UP2 surveyed (was surveyed by)**

**Domain:**

U3 Survey Process Unit

**Range:**

U4 Survey Surface Unit

**Subproperty of:**

S19 Encounter Event:O19 has found object (was object found by):E18 Physical Thing

**Scope note:**

This property relates an instance of U3 Survey Process Unit to a particular instance of U4 Survey Surface Unit which is both its place and object of activity. A single location / U4 Survey Surface Unit may be surveyed by multiple different U3 Survey Process Units.

**Examples:**

The systematic field walking that took place in unit 2004 of the Nettuno Survey

The systematic survey of the site of Thespieae during the Boeotia survey

**In First Order Logic:**

$UP2(x,y) \Rightarrow U3(x)$

$UP2(x,y) \Rightarrow U4(y)$

$UP2(x,y) \Rightarrow O19(x,y)$

## **UP3 collected (was collected by)**

**Domain:**

U2 Survey Collection Activity

**Range:**

U6 Material Sample

**Subproperty of:**

S2 Sample Taking:O5 removed (was removed by):S13 Sample

**Scope note:**

This property relates an instance of U2 Survey Collection Activity to the U6 Material Sample Unit that it collected. It describes the act of collecting a set of objects from a Surface Survey Unit according to a given procedure, as part of a Survey Process Unit.

**Examples:**

The collecting of sample 200401 from unit 2004 in the Nettuno Survey

**In First Order Logic:**

$UP3(x,y) \Rightarrow U2(x)$

$UP3(x,y) \Rightarrow U6(y)$

$UP3(x,y) \Rightarrow O5(x,y)$