

## Flow of Events for Use Case – Find Distance

Change Log	
12/06/2004	Created This use case replaces the previous use cases 'Find Distance to Power Lines' and 'Find Distance to Construction'.
31/10/2004	Finalized for pre-integrated model

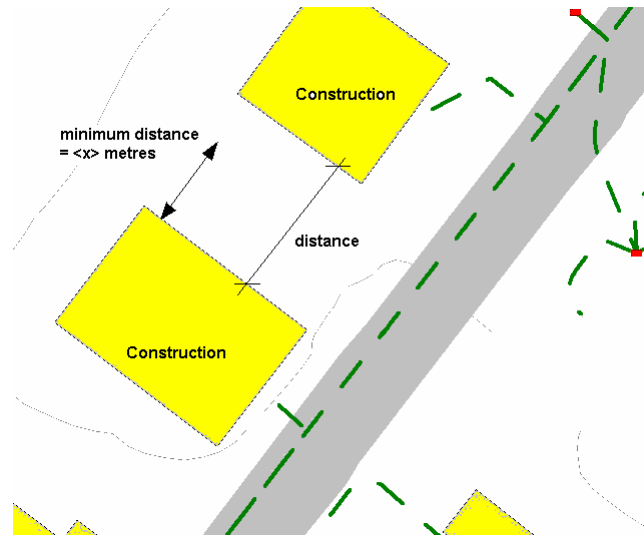
### Overview

Determines the actual physical distance between a construction of interest and a main power distribution cable or the actual physical distance between two constructions.



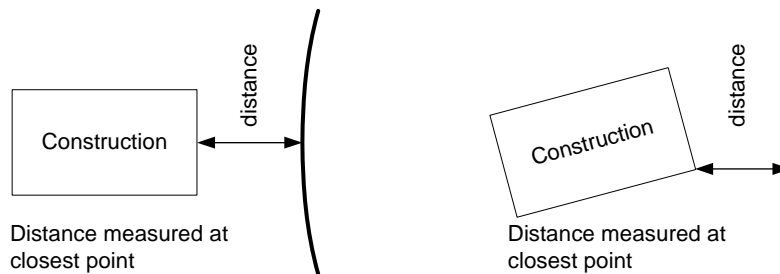
**Figure 1: Distance from construction to power line**

Distance is measured at the closest point of approach between the construction and the other entity of interest (main power distribution cable, other construction or road). Therefore, the minimum distance possible has to be determined where a set of possibilities exists.



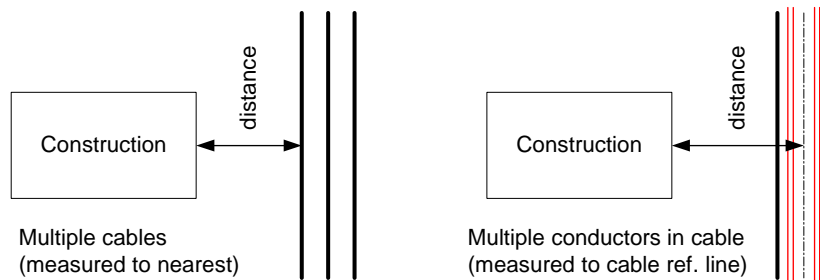
**Figure 2: Distance from construction to adjacent construction**

In the case of a power distribution cable, that which is of interest is the main distribution line provided by a utility company and not a feeder line that brings power into the construction.



**Figure 3: Measuring at the closest point**

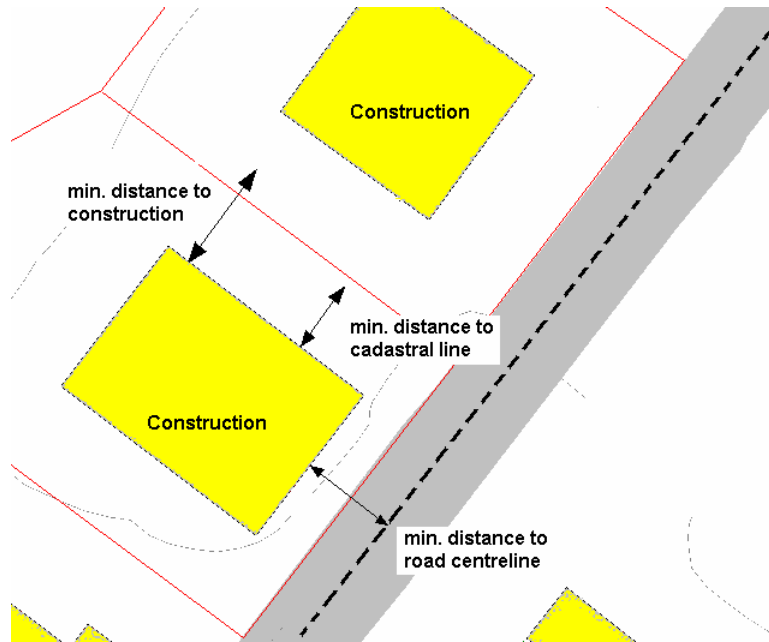
Note that in the case of a group of distribution cables, interest is in that which is closest to the physical construction. Where a set of individually identifiable conductors that are grouped within a sheath into a single cable are concerned (e.g. as in a multi-phase supply), the reference line describing the topology of the cable shall be considered (not the reference lines describing the topology of individual conductors).



**Figure 4: Measuring to power lines**

This use case also captures the minimum distances required from the construction to:

- Adjacent constructions
- Cadastral lines
- Road centreline
- Shoreline (for constructions adjacent to the seashore)



**Figure 5: Minimum distances**

Minimum distance is determined as the closest point of approach between the construction and the other entity of concern. It is the minimum distance that is allowed to any other entity of the type concerned such that the same value may be used for e.g. all adjacent constructions, all cadastral lines etc.

## **Process**

### **Preconditions**

1. Physical construction from which, and to which, distances are to be measured must be defined and located.
2. Main distribution cables must be defined and located and identified as being flow segments of type IfcCableSegmentType
3. The reference line for an adjacent road must be an identifiable shape representation for that road.
4. Cadastral lines must be defined and located (for measurement to cadastre)
5. Shoreline must be defined and located (for measurement to shoreline)

### **Actors**

Authority for setting constraint distance  
Applicant or Authority (for finding actual distance)

### **Main Flow**

1. Determine the physical construction of interest.
2. If distance is to be found and captured then <S1>
3. If minimum and/or maximum distance required is to be captured then <S2>

## Subflows

### **S1: Find Distance**

Flow	Entity
1. Determine the closest instance of the entity whose distance is to be measured (IfcFlowSegment that is defined as an IfcCableSegmentType for power lines; IfcBuilding for adjacent construction; IfcGeographicElement using the Reference Line shape representation for road centreline)	IfcFlowSegment IfcCableSegmentType IfcBuilding IfcGeographicElement
2. For a power distribution cable, confirm that this forms part of a system or subsystem that is named as a main power distribution line (or equivalent system name as defined by a system naming dictionary).	IfcSystem
3. Define an instance of IfcRelAssignsProductProximity to determine the proximity relationship.	IfcRelAssignsProductProximity
4. Make the construction (building or geographic element) into the relating element and the other entity of interest (flow segment, building or geographic element) into the related element	IfcBuilding IfcGeographicElement IfcFlowSegment
5. Using the projected shape of the construction onto the ground, and the start and end point of the flow segment, calculate the minimum distance between the construction and the related entity. The straight line defining the distance will be perpendicular to the tangent of the curve defining the related entity at the closest point.	IfcShapeRepresentation
6. Capture the point along the length of the curve describing the flow segment as an IfcPoint.	IfcPoint
7. Capture the distance calculated as the attribute IfcRelAssignsProductProximity.ProximityVect or	IfcRelAssignsProductProximity.ProximityVect or
8. On completion the distance between the construction and the related entity of interest may be annotated.	

### **S2: Set Minimum/Maximum Distance**

Flow	Entity
1. Specify the minimum/maximum distances required and capture them using IfcRelAssignsProductProximity.ConstraintProximity and IfcConstraint (subtype = IfcMetric)	IfcRelAssignsProductProximity.ConstraintProximity IfcConstraint (IfcMetric)
2. On completion the minimum distances required may be annotated.	

## Post Conditions

The closest distance between a construction and a related entity of interest will be known and recorded.  
The closest distance allowed between constructions will be known and recorded.

## IFC Usage and Extension Requirements

### Existing Entity/Class Usage

<i>Entity Class Name</i>	<i>Usage</i>
IfcBuilding	The building to which the proximity is to be determined or the adjacent building whose proximity is to be determined.
IfcCableSegmentType	Defines the cable type of the flow segment.
IfcConstraint	A constraint that is applied to specify a minimum/maximum etc. distance between occurrences and that can therefore be tested against actual distance.
IfcFlowSegment	Specifies the flow segment of a system from which distance to the physical construction is to be measured.
IfcPoint	The point along the edge representing a power line or reference line of a road at which the related entity most closely approaches the physical construction.

### New Entity/Class Requirement

<i>Entity Class Name</i>	<i>Usage</i>
IfcRelAssignsProductProximity	Subtype of IfcRelAssignsToProduct that defines a proximity relationship between an instance of IfcProduct and an instance of IfcObject.

<i>Attribute</i>	<i>Cardinality</i>	<i>Datatype</i>	<i>Definition</i>
RelatedObjects	1	IfcObject	A redefined attribute that has a restricted cardinality of exactly one rather than the SET [1:?] of the supertype.
ProximityPoint	0:1	IfcPoint	The point along the curve defining the flow segment at which the relating physical construction is closest
ProximityVector	0:1	IfcVector	The vector (direction and magnitude) at the point at which the related element most closely approaches the relating element.
ConstraintProximity	0:1	IfcConstraint	A constraint that specifies required proximity distance. The constraint itself identifies the nature of the proximity distance being specified. This could be e.g. MinimumProximityOfConstruction, MinimumProximityOfCadastre, MinimumProximityOfRoad etc.

<i>#</i>	<i>Type (DER, U, WHERE)</i>	<i>Proposition</i>
WR1	WHERE	Describes the requirement that either the ProximityPoint attribute and the ProximityVector attribute must both be asserted or that the ConstraintProximity attribute is asserted. ProximityPoint and ProximityVector must be asserted together; they must not be individually asserted. Nothing in this rule precludes the assertion of all attributes which allows actual proximity to be tested against constraint proximity.

<i>Entity Class Name</i>	<i>Usage</i>
IfcGeographicElement	The element describing the road or other geographic element and having a shape representation identified as the 'Reference Line'.

<i>Attribute</i>	<i>Cardinality</i>	<i>Datatype</i>	<i>Definition</i>

### Issue List

<i>Question</i>	<i>Answer</i>
[TL 16.08.2004] in my understanding the actual proximity should not be stored in IFC (e.g. by IfcRelConnectsByProximity). There should be applications that can calculate the proximity by	[TL 16.08.2004] proposed answer: do not store actual proximity in IFC as it has the danger to be easily outdated and inconsistent (if the objects are modified). Only store proximity requirements.

accepting IFC (IfcBuilding, IfcDuct, etc.) as input and check for proximity (similarly how current collision checking applications work)

[JDW 29.09.2004] Constraint included. It is intended to capture a requirement that is relevant in an event and therefore questions of outdating are not at issue.