

A Linked Building Data Approach to Site Planning and Managing Temporary Construction Items (TCIs)

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Agenda

- I. State of the Art & Concept Solution
- II. TCI Ontology
- III. TCI Management with the ontology
- IV. Proof of Concept (Case Study)







I. State of the Art & Concept Solution



State of Art





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Proposed Concept Solution



Goals to be accomplished

- a) Automatically evaluate the building model geometry
- b) Identify required TCIs to each building element of the building model by applying the rule-based algorithm
- c) Link the building objects with their respective TCI-information to the building locations and schedule
- d) Develop a **TCI-utilization plan** based on the building elements, their locations and schedule information
- e) Enable **passive monitoring** of the TCI items with progress monitoring data
- f) Visualize data automatically and interactively for all relevant stakeholders





III. TCI Ontology



BOT-Ontology





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Missing ontology for temporary construction items (TCIs)





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Missing ontology for temporary construction items (TCIs)





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https://alex-schlachter27.github.io/LBD-for-TCI/TCI https://w3id.org/lbs/tci#

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IV. TCI Management with the ontology (Competency Questions)



Competency Questions



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Competency Question 1

How to calculate the TCI utilization with building element quantities?

Get PCI information

SELECT * WHERE {

?s a product:Wall ;
 props:elementID ?ID ;
 props:length ?length ;
 props:angle ?angle .
OPTIONAL { ?s bot:adjacentElement ?adjacentElements } }

Get TCI information

SELECT * WHERE { ?TCI a ?tciSet, tci:Panel ; props:length ?length ; props:height ?height ; props:area ?area ; props:width ?width ; props:weight ?weight . }







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Simple Formwork Calculation Algorithm





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Competency Question 2

How to differentiate, where an automatic calculation is suitable and

where a custom calculation is needed by an engineer?





Case Study – Results





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Competency Question 3

How to link TCI quantities to time scheduling?



inst:Wall A							
a bo	t:Element, product:Wall :						
prop	s:elementTD "641019" :						
prop	s:revitCUID "40cabld1-1d6f-47a3-9afb-bd8c6300ff7e-0009c7fb"						
prop	countDefaultCounter 8 :						
tei:	countDefaultPonel320x120 2 :						
toi.	countDefaultPanel220x240 6						
tci:	countDefaultPanelSS0X240 6 ;						
tci:	countDefaultFusheultFop 10 ;						
tci:	countDefaultHeRod 12 ;						
tci:	countDefaultwingnut 12 ;						
tci:	countTimberFilling 2 ;						
tci:	hasTimberFillinglength "0.5" xsd:decimal;						
bot:	adjacentElement inst:Wall_B , inst:Wall_C ;						
prop	s:angle 90.0 ;						
prop	s:area 24.0 ;						
prop	s:height 3.0 ;						
prop	s:length 8.4 ;						
prop	s:level "Level2" .						
lbs:	hasLocation "Lev2_locb(e)" ;						
lbs:	<pre>taskActualEndDate ""^^xsd:dateTime ;</pre>						
lbs:	<pre>taskActualStartDate "2019-04-15"^^xsd:dateTime ;</pre>						
lbs:	<pre>taskPlannedEndDate "2019-04-22"^^xsd:dateTime ;</pre>						
lbs:	<pre>lbs:taskPlannedStartDate "2019-04-15"^^xsd:dateTime ;</pre>						
lbs:	taskProgressCompletion "0.55"^^xsd:nonNegativeInteger ;						
lber	taskProgressDate "2019-04-17"^^ysd.dateTime :						



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V. Proof of Concept (Case Study)



System Architecture





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Results of the Case Study

R		Data bdel	TC Defau 2000	ci Da It Form	ta work K ed Data to d	S TCI Pro MAX	upplier duct Catalogue PERI IMO MX15	utilizatio	LBS Data Location-based Schedule		Progres	ss Data cute እ	
Revit			TCI				VICO			E	Exicute		
ElementiD	props: length	Primary Formwork	Count	props: length	Secondary Formwork	Count	taskPlanned StartDate	taskPlanned EndDate	taskProgress Date	taskProgress Completion	taskActual StartDate	taskActual EndDate	
string	m	string	integer	m	string	integer	DateTime	DateTime	DateTime	%	DateTime	DateTime	
585914	6.20	Default Panel 330x240 Default Panel 330x120 Wooden filling material	4 2 2	2.40 1.20 0.20	Default Wingnut Default Tie Rod Default Coupler Default PushPull Prop Default Waler	12 12 16 6 0	2019-04-04 11:00	2019-04-08 07:28	2019-04-06 11:00	70.0	2019-04-04 11:00	NULL	
644734	6.20	Default Panel 330x240 Default Panel 330x120 Wooden filling material	4 2 2	2.40 1.20 0.20	Default Wingnut Default Tie Rod Default Coupler Default PushPull Prop Default Waler	12 12 16 6 0	2019-04-08 07:28	2019-04-09 11:57	2019-04-08 16:00	100.0	2019-04-08 11:00	2019-04-08 16:00	



TCI Utilization Plan

Power BI Dashboard Visualization





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Questions?

