# THE ROLE of BIM in Managing the SUPPLY CHAIN

During Temporary Works





#### ACHASM Conference 2018, Belmont Square

#### **Willem Adriaan Brits**

Director – Head of Engineering Sub Saharan Africa PERI – Formwork Scaffolding Engineer (Pty) Ltd





Nicholas Klokholm V Following Help the Construction industry to be more Data-Driven | Real Time Project Management | IoT | Integration Of System





Smart design wins projects: poor design costs time and money and failure, should it occur, often results in fatality."

# The importance of **BIM** in temporary works

Bill Hewlett MA, FICE, C.Eng.





# The 3 biggest problems in the construction industry:

- 1) Cost underestimation a "budget overrun" is the consequence of underestimating costs in the first place.
- 2) Optimistic planning a "time overrun" is the consequence of underestimating actual time used or lack of detail in the planning.
- 3) Lack of communication construction is one of the least tech-driven industries and we are extremely silo-based.





"Nicholas Klokholm Copenhagen, Capital Region, Denmark"

Change is difficult, even terrifying, and it will require you to leave your comfort zone.....





- **B** Onsite Collaboration
- C Safety and Commissioning of Sub Elements
- **D** Questions & Answers









#### Limited to No Pre-Tender / Planning phase involvement



• Leads to the Industry suffering from *"It will be sorted out on site sickness".* 





# This can be Changed / Improved through an Inclusiveness (BIM) Pre-Tendering phase:

- Improvement on constructibility methods.
- Saving time and money.







# EARLY INCLUSION OF SPECIALIST SUPPLIERS









#### • Minimize Risk to all parties involved;

Detail available at the touch of a button;



**3D Model** 





#### **Document links**





- This can be Changed / Improved through an Inclusiveness (BIM) Pre-Tendering phase:
  - Improvement on constructibility methods
  - Saving time and money.
  - Understanding what the project delivery method is and what is required from the client :







#### BIM Execution Plan (BEP) is required to enable early involvement;

Are clients informed?



- Data Exchange Protocols & Security?
- BIM Mock-up?





#### Minimize Risk to both parties involved; Details available on a touch of a button - checklists AUTC 🔔 6 🛛 RB Save Save + Close EX: Colu 6 4 Details Issues 6 5 N/A Details Issues 6 6 Details Issues 07 Details Issues





#### Minimize Risk to both parties involved;

From the suppliers side (H&S as well as functionality)



#### **Correct Installation Verified – real time**







#### On site problem solving or issues raised;

- Direct link to supplier and professional team
- Early corrective measures problem identification
- Improvement on future project via Route Cause Analysis

Tue 11/14/2017 6:05 AM			
Shaldana MOG project <projects@velaserver.com> ***Soam*** Autodock RIM 360 Field issues changed as commonication in the "Shaldana MOG project" project</projects@velaserver.com>	Edit Issue 000081	Save	Close
To Strydom, Pieter	Details		
The following issue changes took place in the 'Shaldana MOG project' project, assigned to PERI GMBH, between Nov 13, 2017 4:00 AM and Nov 14, 2017 4:00 AM:	Remind assigned company		
1 new issue was reported	Issue type	QA/QC	¥
0 issues changed status	* Issue ID	000081	
0 issues changed their assigned company	* Description	General Note :Ensure Top Diagonal bracing is Opposite to Bottom Diagonal bracing, diagonal bracing not in opposite direction. Johan van Dyk says Peri it is not necessar	у.
Click the link below to sign in to Autodesk BIM 360 Field for details on these issues. Your user name is pieter.strydom@peri.co.za			4
https://bim360field.autodesk.com/set_project?id=ec0562a0-693b-4cb4-b107-2a86c5deabfd&return_to=%2Fissues	Source	Equipment POURING SEGMENT 1 [MOVING OF WORKING PLATFORM] X	
Here is a sampling of the changes:		Checklist EX: Gantry Checks [Open]	
New issues reported included (showing 1 of 1 total): 000082: In regards to Issue Number created as Void	Root cause Company	Drawing issue Contractor	• •
	Author	clifford_overbury@wbho.co.za	

If you have any questions about Autodesk BIM 360 Field, visit our Help site at http://help.autodesk.com/view/BM360F/ENU/

You are receiving this notification due to your user settings. To adjust your settings, click your initials and go to Settings. To stop receiving these messages go to: <a href="https://bim360field.autodesk.com/optout/9ADF6396E4514426B1E3A6E2CFC4C66D">https://bim360field.autodesk.com/optout/9ADF6396E4514426B1E3A6E2CFC4C66D</a>





		B AUTODESK" BIM 360" FIELD	Shaldana MOG project	- ) Photos				
-	On site problem solving and issues raised	Image: Approximation   Image: Approximation	N E NIMBERS TO BE USED	MAL BRACING AND	Doomber 2017-747			
Edit Issue 000098		Save	Close		Edit Issue 000098		Save	Close
Issue type	QA/QC	•	1	•	Details			
* Issue ID	000098		]		Add commont			
* Description	Ensure Bottom Gantry Spindles are at correct and 41deg as per pin holes, is this a problem?	gle for load distribution. Bracing at					O	
Source	Checklist EX: Gantry Checks : Tank 4 : Grid : AK-A	AL [Closed] 🗙			pieter.strydom@peri.co.za X Jan 29, 2018 6:38 PM This is acceptable. The silven reference angle is a sui	de te enquire thet use are along to it only		
Root cause	Drawing issue	•	]			de lo ensure that we are close to it only.		
Company	WBHO	۲	1		jacob.scholtz@wbho.co.za .lan 29. 2018 9:39 AM			
Author	jacob.scholtz@wbho.co.za		]		Bracing at 41deg as per pin holes, is this a problem?			
Status	Open	T	]					
Due date	Jan 30, 2018							
Location		*						





#### On site Monitoring & Control for Professional Team & Supplier;

Reduction in paper work – more time spend on actual site – lead to improvemnts - Reporting

Shaldana	MOG project Check	list Details			Shaldana	a MOG project	Checklist Details	
Details					Item #	Item Text	Response	# Issue
ID	001754	Company	Contractor		12	Ensure Base Plate is fastened to Special De correctly as per issued drawing.	esign Waler and installed Yes	0
Name	Wall Inspection - Location One	Priority	Medium					
Descripti	9D	Status	Closed					
Author	jacob.scholtz@wbho.co.za	Location	<top level=""></top>					
Created	On 21 Sep 2017 10:30 AM	Equipment Name	Wall One			A state in the state		III
Tags	A	Equipment Barcode						
	X					2017-09-21 10:57:12	2017-09-21 11:03:49	2017-09-21 11:16:31
X								
Signatu	re: Jacob Scholtz 21 Sep 2017 10:57 AM							
Checklis	t Items							
Item #	Item Text	Response		# Issues				
1	Ensure all BFD's are installed and fixed correctly as per issued drawing.	Yes		0		2017-09-21 11:16:51		
2	Ensure all Walers are installed are fixed correctly as per issued drawing.	Yes		0		2017-05-21 11:10:51		
	Comments							
	Additional walers added at top 2 joints							
2	Ensure all Tip rads (DW20), shy Wingput Divet Plates are installed as per	Vac		0	End of V	Vall Inspection - Location One - 00175	4 images	
3	issued drawing.	ies		U				
4	Ensure SK Cone System is installed per instruction per tie fixing position.	Yes		0				
5	Ensure bottom Walers are installed and fixed to TRIO Panels as per issued drawing.	Yes		0				
6	Ensure Rock Anchors are installed and drilled to correct depth as per issued drawing.	Yes		0				
7	Ensure front bolt installed on Special Design Waler.	Yes		0				
8	Ensure uplift brackets are installed correctly on inclined side only.	Yes		0				
9	Ensure sufficient number of props are used per wall pour. Refer to issued drawing.	Yes		0				
10	Ensure concreting platform openings and edges are closed.	Yes		0				









#### From a supply side (Intelligent Parts)

- Progress can be monitored in terms of supply on large scale project
- Detail parts for order placement / planning











# Intelligent Parts

- Detail parts for order placement / planning;
- Incorporation or QR coding;



3D Model Incl. QR or other coding



#### **Actual Coding**





#### Improvement of Health and Safety on site.

On site monitoring – find ENCOURAGE: repsonsiveness are bigger onus to do actual check – knowing that someone will know -

Shaldana	MOG project Ch	ecklist Details		
Details				
ID	001808	Company	Contractor	
Name	EX: Pre-Concreting	Priority	Medium	
Descripti	on	Status	Closed	
Author	jacob.scholtz@wbho.co.za	Location	<top level=""></top>	
Created (	On 03 Feb 2018 8:16 AM			
Tags				
X Signatur Checklis	re: Jacob Scholtz 05 Feb 2018 7:20 AM			
Item #	Item Text	Response		# Issues
Item #	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail	Response Yes		# Issues 0
1 2	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses.	Response Yes nut Yes		# Issues 0 0
1 2 3	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame".	Response Yes nut Yes Yes		# Issues 0 0
1 2 3 4	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin	Response Yes No		# Issues 0 0 0 0
1 2 3 4	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments.	Response Yes nut Yes Yes No		# Issues 0 0 0 0
Item # 1 2 3 4	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings	Response Yes Yes Yes No		# Issues 0 0 0
Item # 1 2 3 4	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored.	Response Yes Nut Yes No Yes		# Issues 0 0 0 0
Item # 1 2 3 4 5 6	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored. Ensure Bottom Chord is bearing equally on roller - therefore centerect	Response Yes Nut Yes No Yes . Yes		# Issues 0 0 0 0 0
Item # 1 2 3 4 5 6 7	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored. Ensure system is Anchored back to previous pour, ensure special bas plate is anchored.	Response Yes Nut Yes No Yes . Yes . Yes e Yes		# Issues 0 0 0 0 0 0 0 0 0 0 0 0
Item # 1 2 3 4 5 6 7 8	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored. Ensure Bottom Chord is bearing equally on roller - therefore centered Ensure system is Anchored back to previous pour, ensure special bas plate is anchored. Ensure bracing props are inserted and engaged.	Response Yes No Yes No Yes Yes Yes Yes Yes		# Issues 0 0 0 0 0 0 0 0 0 0
Item # 1 2 3 4 5 6 7 8 9	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure "Roller Table Trusss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored. Ensure Bottom Chord is bearing equally on roller - therefore centered Ensure System is Anchored back to previous pour, ensure special bas plate is anchored. Ensure Traing props are inserted and engaged. Sm Bay - Bracing Props to be removed/disengaged proir to concretin	Response Yes No Yes No Yes Yes Yes Yes Yes Yes Yes		# Issues 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Item # 1 2 3 4 5 6 7 8 9 10	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored. Ensure Bottom Chord is bearing equally on roller - therefore centered Ensures bristem is Anchored back to previous pour, ensure special bas plate is anchored. Ensure bracing props are inserted and engaged. Sm Bay - Bracing Props to be removed/disengaged proir to concreting Ensure Sm Bay - Ties are engaged and hand tightened.	Response Yes No Yes No Yes Yes Yes Yes Yes Yes Yes		# Issues 0 0 0 0 0 0 0 0 0 0 0 0 0
Item # 1 2 3 4 5 6 7 8 9 10 11	Item Text Ensure "Roller Table Truss" is not in contact with Launching Rail Ensure Tie-Rods are tensioned on all "Roller Table Trusses", c/w wing pivot plate. Ensure Tie combinationis adhered to on all Roller Table Trusses. Ensure Camnuts are engaged within "Tie Yoke Frame". Ensure "Yoke-Tie-Frame" is secured with D21-120 Pin c/w Cotter Pin Comments not as per drawings Ensure Wall Bracket is secured and Anchored. Ensure Wall Bracket is secured and Anchored. Ensure Bottom Chord is bearing equally on roller - therefore centered Ensure system is Anchored back to previous pour, ensure special bas plate is anchored. Ensure bracing props are inserted and engaged. Sm Bay - Bracing Props to be removed/disengaged proir to concreting Ensure "Rack and Pinion jacks" and "Spindle Jacks" are prior to concreting, disengaged.	Response Yes No Yes No Yes Yes Yes Yes Yes Yes Yes Yes Yes		# Issues 0 0 0 0 0 0 0 0 0 0 0 0 0

opends to be Installed - Designed and supplied by Contractor. sure Tables are at correct level and slope prior to concreting. gage safety rails of table trusses sure Top End Rails where Hanging Tie Unit is installed has a pin or b perted on end to prevent slide off.	Yes Yes Yes olt Yes	0
sure Tables are at correct level and slope prior to concreting. gage safety rails of table trusses sure Top End Rails where Hanging Tie Unit is installed has a pin or t serted on end to prevent slide off.	Yes Yes olt Yes	0
gage safety rails of table trusses sure Top End Rails where Hanging Tie Unit is installed has a pin or t serted on end to prevent slide off.	Yes olt Yes	0
sure Top End Rails where Hanging Tie Unit is installed has a pin or t serted on end to prevent slide off.	olt Yes	0
		U
2018-02-05 06:53:48 2018-02-	05 06:54:00	2018-02-05 06:54:05
2018-02-05 06:54:30 2018-02-	05 06:54:51	
re-Concreting - 001808 images		
	2018-02-05 06:53:48       2018-02         2018-02-05 06:53:48       2018-02         2018-02-05 06:54:30       2018-02         2018-02-05 06:54:30       2018-02	2018-02-05 06:53:48       2018-02-05 06:54:00         2018-02-05 06:54:30       2018-02-05 06:54:51         2018-02-05 06:54:31       2018-02-05 06:54:51





#### Improvement of Health and Safety on site.

 From: Clifford\_Overbury@wbho.co.za [mailto:Clifford\_Overbury@wbho.co.za]

 Sent: Monday, November 13, 2017 12:46 PM

 To: Strydom, Pieter < Pieter.Strydom@peri.co.za>

 Cc: jacob\_Scholtz@wbho.co.za; jean-Pierre\_Cairns@wbho.co.za; Van Dyk, Johan < Johan.vanDyk@peri.co.za>; juan\_swart@wbho.co.za; Brits, Riaan < Riaan.Brits@peri.co.za>; Burwitz, Sebastian < Sebastian.Burwitz@peri.co.za>; Beyers,

 Werner < Werner.Beyers@peri.co.za>

 Subject: Re: Checklist Modified - Saldanha

Hi Pieter,

Can we also split the Gantry into 7 sections as discussed on site, so we can check each one on its own.

Regards



**Clifford Overbury** 

Assistant Site Agent OTMS Tank Farm - Saldanha Cell: 071 681 6869

Clifford Overbury@wbho.co.za







#### Improvement of Health and Safety on site by following processes









- Ensuring Standards (design and manufacturing) are adhered to and maintained within the project.
  - Improving Quality







#### Improvement of Health and Safety on site by following processes;







# Shortcomming

- Lack of automated Weather data:
  - Wind speed, rainfall etc.

B	AUTODESK <sup>®</sup> BIM 360	FIELD Shaldana MOG proj	ect - > Daily Updates				
	Sunday, Mar. 4	Weather Snapshot	Enter Location:	ation: e.g. address, postal code and country			
	Save Draft	This project's address has not yet b the fields below manually. To autom	een specified. You may obtain weat hate the retrieval of weather data in t	her data for this Daily he future, contact you	Update by entering the r project administrator.	project location abov	e, or completing
	Publish	Project Address Not Available				Power	ed by Forecast.io
<u> </u>	WEATHER	Conditions		High		Low	
*	LABOR GENERAL NOTES	Enter brief weather description	٩	°C o at at		°C	
*		Visibility	Humidity	Wind	kph		mm
	ACTIONS:						
	Print Daily Update     Delete	Add any relevant notes here					

GPS location's for check's performed on site;







- Shortcomming Cell & Andriod use
- Case Study
  - Using BIM 360 Field on Iphones

for inspection checks – Resivior with  $\ensuremath{\mathsf{SS}}$ 

	100	12:25 PM			69%
hecklists	Find	d Checklists EX: Gantry Checks		Q H	eader
0	1	Ensure Rail Couplings have all their pins installed:	10	No	N/A
A Issue		Tap to enter comments			
0	2	Ensure all Gusset Plates have their respective Pins w Cotter Pins installed.	1	No	NA
A Issue		Tap to enter comments.			
0	3	Ensure Spindles are correctly installed	Yes		NA
1 issue		Tap to enter commerts			
0	4	UK70 Coupling for top SRU Waler connection is complete with Pins and Cotter Pins.	1	No	NA
A Issue		Tap to enter comments			
0	5	Internal Bracing - Scatfold Tubing needs to be correctly fastened.	1	No	NA
A Issue		Tap to enter comments			
	6	Top SRU Bracing	Yes	No	NA
A Issue		Tap to enter comments			
	7	Bottom RCS Rail	Yes	No	NA
A Issue		Tap to enter comments			
0	8	General Note :Ensure Top Diagonal bracing is Opposite to Bottom Diagonal bracing.	Yes	No	N/A
lssue		Tap to enter comments			
0	9	Ensure Gantry is centered onto " Helicopter"	Yes	No	NA
= *	0	AUTODESK' BIM 360" FIELD		1	11







## Actual Findings from Suppliers side on SALDANHA OIL BUNKERS

- High Level of Risk Mitigation achieved
- Inverse safety
- Decrease in assembly time due to visual and interactive assembly aids
- Improved accuracies
- Reduced turn around times on missing detail etc.
- Improved Intercation and response time from PERI due to realtime (as close as possible) information.







"Though Enabling Suppliers; Owners and Professional Teams can realise all benefits"

	RE OWNERS	
1 0 1 0		
	Cost saving	
	<ul> <li>Quality enhancement</li> </ul>	
	Health & Safety – OSHAct	
	Easier documentation	<ul> <li>Site Monitoring</li> </ul>
	Easier communication	Accurate planning

Less danger situations

Cost & Time saving

Quality enhancement





In closing "I have heard consultants say":

"Yes, we already knew it would go above budget but as we are in a tendering situation, we deliver what they ask for to the level they demand, and we take the rest on the go with the client as we would not have gotten the job otherwise".



PITTSBURGH POST-GAZETTE SUNDAY, NOVEMBER 1. 2009 WWW.POST-GAZETTE.COM



# **QUESTIONS**?