

**2-STAGE INNOVATION GRANT (iGRANT)
REQUEST FOR PROPOSALS (RFP)**

Research Areas	Solution for Automated Code Compliance Check in BIM
Category	Open Call
Open Date for Proposal Submission	01 September 2016
Close Date for Proposal Submission	14 October 2016 2 Hardcopy proposals and 1 electronic copy must reach the iGrant Secretariat by 1200 hrs Singapore time of the stipulated date.
Contact	iGrant Secretariat c/o: Building and Construction Authority Research Planning & Programmes Department 200 Braddell Road ZEB Level 3 Singapore 579700
Enquiries	For more information, please refer to website: https://www.bca.gov.sg/ResearchInnovation/2stage_innovationgrant.html

CALL FOR PROPOSALS: SOLUTIONS FOR CODE COMPLIANCE CHECK IN BIM

Background

1. The 2-Stage Innovation Grant (iGrant) funded by Ministry of National Development launched the Grant Call for Solutions for Automated Code Compliance Check in BIM on 01 September 2016.

BIM Submission for Regulatory Approval

2. Building Information Modelling (BIM) is currently widely used by the local industry. Since 1 July 2015, all projects with GFA of more than 5,000 sqm are required to be prepared and submitted in BIM for regulatory approval.

Current Gaps or Needs

3. To fully harness the capability of BIM and improve overall construction productivity, there is a need to explore the use of new technology that will aid in the model validation process so that issues in the model are detected and addressed upfront.

4. Model validation by software assists industry to self-check before plans are submitted to BCA for approval. QPs may approach BCA in the early stages for consultation to address identified issues so as to ensure such issues do not delay the progress of the project. Consultation with BCA improves the turnaround time by expediting the approval process and reducing the time needed to commence works onsite. More importantly, it avoids unnecessary and costly reworks when the non-compliances are identified before the building may be commissioned. .

5. Today, conventional BIM-based model checking softwares ('model checkers') are used by the industry to ensure quality assurance throughout the entire value chain. Model checkers have the ability to identify spaces and elements as well as carry out geometry checking and logic checking. It is technically possible for the model checker to be enhanced or customised to perform automated code compliance check and improve the efficiency and accuracy in regulatory processing.

Objective of Grant Call

6. The two objectives of this grant call are:
 - a. Tapping and enhancing current technologies to develop a model checker that performs rule-based code compliance check within a BIM model
 - b. Improving productivity among industry consultants as well as regulatory agencies by harnessing available technologies to aid in identifying and resolving non-compliances within a BIM model before regulatory submission and construction.

Scope of Grant Call

7. The following are potential areas for the development of Solutions for Automated Code Compliance Check (“model checker”).
 - a. Conduct integrity check on the BIM model to ensure it meets the pre-requisite for the functions of code compliance checking
 - b. Develop robust checking engine that supports rule-based check, capable of identifying areas of non-compliances with the stipulated regulatory requirements
 - c. Provision of features such as
 - Error reporting for users
 - Allow customisation to the parameters of the rules sets created
8. Please see para 9 and 10 for the detailed requirements expected for Stage 1 and 2 of the grant call.

Stage 1 of iGrant – Proof of Concept

9. For the purpose of Stage 1 (Proof of Concept) of this grant call, the model checker must demonstrate the following. To facilitate the assessment, the applicant must provide the evaluation panel free access to the prototype of the proposed solution.
 - a. Geometry Check (e.g.: dimensions, gradient of a ramp)
 - Minimum headroom of 2m along circulation routes
 - Minimum corridor clear width of 1.5m for barrier free access route

- The barrier free access route must not have any sudden change in level. Ramps that mitigate level changes has to comply with the table below.

Changes in Levels

Changes in Vertical Rise (mm)	Gradient not steeper than
0 to 15	1 : 2
more than 15 to 50	1 : 5
more than 50 to 200	1 : 10
Exceeding 200	1 : 12

b. Tabulation of spaces/ objects

- i. The size of the window on the exterior façade of the building should be at least 5% of the size of the room space/ space it is ventilating
- ii. For every 10 car park lots provided, there should be at least 1 accessible car park lot provided for wheelchair users.

Note: It may be assumed that the designer will use standard objects for car park lots and accessible car park lots. Size of car park lot is 4.8m by 2.4m. Size of an accessible car park lot is 4.8m by 3.6m.

c. Logic Check

- i. Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided.

d. Pre-check on BIM model

- i. Identifying areas within the BIM models that have unidentified spaces or spaces that are not in the pre-defined list

Note: It may be assumed that the designer will adhere to a set of space classification during modelling.

Stage 2 of iGrant - Implementation

10. The model checker is expected to provide the rule checking functions for the requirements stipulated in Annex A. Successful applicants selected in Stage 2 should declare the extent of stipulated requirements achieved from Annex A. Applicants are reminded that if Stage 2 could be successfully developed and implemented, there is a possibility that the model checker may be adopted by the local construction industry for code checking functions as well as the pre-submission criteria for the purpose of Building Plan approval to BCA. To facilitate the assessment, the applicant must provide the evaluation panel free access to the prototype of the proposed solution.

Note: It may be assumed that the designer will follow a set of prescribed modelling guidelines imposed by the competent authority that will support or facilitate the use of model checker (e.g. standard classification of spaces and elements).

Eligibility

11. This call is open to local companies providing BIM solutions to the local industry.

Funding Support

12. Applicants will qualify for up to 70% of funding support of the total qualifying costs of a project.

13. Proposals should not be funded or be currently considered for funding by other agencies.

14. Funding awarded cannot be used to support overseas R&D activities. All funding awarded must be used to carry out the research activities in Singapore unless approved in the grant.

15. The funding support level for Stage 1 (Proof-of-concept) is up to 70% with a maximum cap of \$20,000, and the project duration is no more than 3 months. For Stage 2, the funding support level is also capped at 70% with a maximum quantum of \$250,000, and the project duration should not be more than 18 months.

Assessment Criteria

16. Proposals will be evaluated against the following criteria:

2-Stage Innovation Grant (iGrant) – Solution for Code Compliance Checking in BIM

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- (1) Innovative new design tools, methods & technologies (50%)
 - a. Ability to tap on BIM technologies to provide rule-based checking
 - b. Provide pre-check on model to ensure basic model quality essential for rule-based checking/ code checking functions
 - c. Robustness, Reliability and Integrity of checking engine
 - Ability to identify non-compliances accurately within the BIM model
 - Reliable results that reflect the true errors and compliances within the model
 - Accuracy and integrity of the checking engine to ensure that all the errors are correctly identified

- (2) Competency and track record of the applicants & project team (20%)
 - a. Competency, experience and relevance of project team
 - b. Track record of similar BIM-related projects/ services rendered to other clients

- (3) Degree of Replicability and Scalability & commercialisation potential (20%)
 - a. User-friendliness of the product
 - User-friendly interface for navigating the BIM model
 - Errors or identified issues are presented in a format or manner which the designer can intuitively understand and perform rectification easily in the BIM model
 - Allow comments to be tagged or documented to the error (e.g. the errors occurred but the project had obtained waivers from the relevant authority)
 - Provide basic measuring tools that are easy to use
 - b. Competitiveness of pricing models for the industry
 - Provide competitive pricing for the local industry so as to facilitate mass adoption
 - c. Maintenance and ease of updating the rules set created:-
 - Subsequent upgrade of the software must be capable of handling openBIM format (e.g. IFC 2.3 and higher versions), as it may be adopted internationally

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- The parameters of the rules should be customisable and not hard coded to facilitate the ease of updates by the relevant authority only
- Following the commission of the project (if successful), the proposal should support maintenance works for the first 2 years of the project
- The rules sets should not be affected by any software upgrade
- Method adopted to address revised requirements

(4) Degree of impact to improve BCA strategic focus areas of productivity and safety
(10%)

Evaluation Process

17. All proposals received by the iGrant Secretariat will be submitted to the Evaluation Panel (EP) for assessment. Comprising representatives from public agencies and the industry, the EP will evaluate and provide recommendations (to award or decline) for the applicants' proposals.

Submission

18. All applicants must send in 2 hard copies and 1 electronic copy of duly signed proposals by 14 October 2016 to the following:

iGrant Secretariat
c/o Building and Construction Authority
Research Planning & Programmes Department
200 Braddell Road
ZEB Level 3
Singapore 579700

Results

19. Successful proposals will be notified by Q4 2016.

~ End ~

REQUIREMENTS EXTRACTED FROM APPROVED DCOUMENT V6.1 AND CODE ON ACCESSIBILITY IN THE BUILT ENVIRONMENT 2013

CLAUSE #	CLAUSE DESCRIPTION	DIMENSIONS		MINIMUM PROVISION	TYPOLOGY							Note	EXEMPTION [The requirements do not apply to the following areas]
		Min. (mm)	Max. (mm)		Res (Landed)	Res (Dvpt)	Commercial	Industrial	Institution	School	Bridge, Jetty, Parks etc		
C. HEADROOM													
3.2.1	Headroom - Room, Access Route, Circulation Space	2000			✓	✓	✓	✓	✓	✓	✓		Attic Room < 10m ² in houses built by owner's for his own use Equipment & Plant Rooms Underside of Staircase/ Escalator that are not along Access Route or Circulation Space Store Rooms < 6m ²
3.2.2	Headroom - Parking Lots, Driveway	2200			NA	✓	✓	✓	✓	✓	NA	Only applied to driveway or parking lots meant for car access	
3.3.1	Ceiling Height - Rooms	2400			✓	✓	✓	✓	✓	✓	NA		Corridors, Lobbies; Toilets, Bathrooms, Lavatories, Powder Rooms; Localised Areas that have a drop in ceiling height due to physical constraints such as structural beams or building services
D. ACCESSIBILITY - REFER ACCESSIBILITY CODE 2013													
2.3 Minimum Accessible Provisions													
	Provision of accessible guestrooms in hotels, chalets, boarding houses			at least 1 in every 200									
	Provision of elderly friendly guestrooms in hotels, chalets, boarding houses			at least 1 in every 50									
	Provision of accessible guestrooms in service apartments, hostels, halls of residence or dormitories			at least 1 in every 100									
	Provision of wheelchair space in cinemas, theatres, concert halls, stadia, halls, auditorium or other places of public resort (with permanent seating)	900 x 1200		at least 1 for every 200 seats									
4.1 Accessibility Around and Within the Buildings													
4.2	Primary Accessible Routes for wheelchair users - 1500mm	1500				✓		✓	✓	✓		Applicable to: Res Dvpt, Hotels, Boarding Houses, Service Apt, Worker Dorm, Hostels, Halls of Res or Dorm; School, Office Buildings; Factories, Workshops, Industrial Buildings & Offices/Showroom Areas in Warehouses	
	Primary Accessible Routes for wheelchair users - 1800mm	1800					✓				✓	Applicable to: Uni, Colleges & Sim. Ins of Learning; Parks, Open Spaces & Places of Public Resort; Sports Complexes & Public Swimming Pools; MRT Stations, Bus Interchanges, Passenger Terminals; Shopping Centres, Multi-purposes Complexes; Markets, Hawker or Food Centres, Restaurants & Eating Establishments; Hospitals, Nursing Homes, Welfare Homes & Homes for the Aged	
4.4	Clear Door opening for Sliding/ Swing Door (for wheelchair users' access)	850				✓	✓	✓	✓	✓	✓		
4.4.6	Minimum Clear Manoeuvring Space at door (push side)	1200 x 1200				✓	✓	✓	✓	✓	✓	Measured from the face of the door	Does not apply to Door of accessible individual toilets, and door to entrance of unit
	Minimum clear space adjacent to the leading edge of the door (push side)	300				✓	✓	✓	✓	✓	✓		
	Minimum Clear Manoeuvring Space at door (pull side)	1500 x 1500				✓	✓	✓	✓	✓	✓		Does not apply to door to entrance of unit of residential development
	Minimum clear space adjacent to the leading edge of the door (pull side)	600											Does not apply to door to entrance of unit of residential development
4.5.1	If change in level is 0-15mm		no steeper than 1:2			✓	✓	✓	✓	✓	✓		
	If change in level is 15-50mm		no steeper than 1:5			✓	✓	✓	✓	✓	✓		
	If change in level is 50-200mm		no steeper than 1:10			✓	✓	✓	✓	✓	✓		
	If change in level is more than 200mm		no steeper than 1:12			✓	✓	✓	✓	✓	✓		
4.6.5.2	Size of Landing Provided for a ramp	1500				✓	✓	✓	✓	✓	✓		
4.6.6.1	Handrail Both Sides of Ramp & Continuous					✓	✓	✓	✓	✓	✓		
4.6.6.2	Handrail extension beyond the top and bottom of the ramp	300											
3.1 Accessible Lift Provided for Transportation													
4.9.1.3	Lift Lobby Manoeuvring Space	1200 x 1500				✓	✓	✓	✓	✓			
4.9.2.1	Lift Car Dimension	1200 x 1400				✓	✓	✓	✓	✓			
4.9.3.1	Clear Opening Lift Door	900				✓	✓	✓	✓	✓			
4.9.4.1	Clear Floor Space in front of Lift calling button	900 x 1200				✓	✓	✓	✓	✓			

