BUILDINGS | Building Energy Modeling





A New "Ruleset" Application Testing Standard to Support Performance-Path Compliance and Above-Code Programs

Performance Ruleset Modeling Standard

Last 5 digits of project number | 75471

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Performance-Path Compliance: Critical for Achieving Net Zero Goals

Performance Rating Methods (PRMs): methodology for code and above-code performance calculations

- Use whole-building energy simulation (BEM) to compare proposed building to a reference baseline to assess compliance
- Baselining transformation defined by "ruleset"
- Many examples: ASHRAE 90.1 Appendix G, CA Title 24 ACM, RESNET ERI

Streamlining and Automating Performance-Path Submission Review

One Approach: Software Certification

Test software using N representative cases

- Used by California, Florida, RESNET
- + Removes maximum burden from reviewers
- Requires interoperability that doesn't exist
- Doesn't handle manually generated baselines
- No way to flag ambiguous situations



Open-Source Ruleset Checking Tool (RCT) for ASHRAE 90.1 -2019 Appendix G

Not a normative part of the standard ... others free to create checkers for other rulesets



Ruleset Checking Tool

- Ruleset Requirements: Description of rules and requirements to be verified by the RCT (including data tables)
- Rule Engine: Validates RPD files against schema, evaluates ruleset application in RPD files

- + Supports both code and above code applications
- + Provides additional design flexibility, credits high-performance designs

Only used <5% of projects in >50% of jurisdictions surveyed!!

- Time and cost associated with generating energy model
- Ruleset automation inconsistent, users can manually "game" baselines
- Submission review is tedious, challenging, inconsistent, and unpredictable
- Review process requires multiple iterations, reducing project throughput

Code & program reviewers want confidence that models comply with rulesets!

Improvement in ASHRAE Standard 90.1 (Year 1975–2019)



Year

Project Evaluation Report

New Approach: Project Checking

- Check ruleset application on a project basis
- + Doesn't require large interoperable test suite, handles manually generated baselines and saves reviewing time
- + Flags ambiguous cases for manual reviews
- + Focuses manual review on "difficult" aspects
- Can add coverage incrementally
- + Can help modeler create a clean submission
- Unfamiliarity with this concept, hasn't been attempted before.
- Would still require some manual review

ASHRAE 229P "Protocols for Evaluating Ruleset Application in Building Performance Models"

Two new software components:
Ruleset Evaluation Schema (RES)
Schema defined at ruleset level

BEM software requirements
Ruleset Project Description (RPD) export

Ruleset Checking software

• Standard output report

requirements

- Test Engine: Contains all rule tests defined in ASHRAE Standard for RCT compliance
- Report Writer: Generates software testing report and project testing report



of detail
 Not a detailed BEM-to-BEM schema
 Not ruleset or simulation engine specific
 RPD exported by BPM vendor
 Ruleset Checking Tool (RCT)
 Checks implementation of ruleset logic on Ruleset Project

 Description submittals
 Produces standard output report. Open-source Compliance with rule tests defined in Standard



Public Review

in 2024!

<pre>space_lighting_power_per_area : space_lighting_power_per_area, "interior_lighting_power_allowance": interior_lighting_power_allowance, } def rule_check(self, context, calc_vals, data=None): return (calc_vals["space_lighting_power_per_area"] == calc_vals["interior_lighting_power_allowance"])</pre>								
-		Ρ	roject 7	Festing R	eport			
Summary: Al	II Rules							
	All Sections	Envelope	Lighting	Receptacles	HVAC-	HVAC -	HVAC-	Transformers
					General	Airside	Waterside	
Rules	104	22	12	5	16	28	21	6
Deeced	40	10	7	4	12	11	0	4

formers Failed 12 20 1 2 18 Not Applicable 0 4 1 1 Undetermined 1 1 3 (Manual Review)

Rule Evaluations

return

Section: Lighting

 Rule Id: 6-1

 Description: The total proposed building interior lighting power shall not exceed the interior lighting power allowance determined using either Standard 90.1-2019

 Table G3.7 or Standard 90.1-2019 Table G3.8.

 90.1-2019 Section: Section G1.2.1(b)

 Overall Rule Evaluation Outcome: Pass

 Number of applicable components: 1

 Component Level Outcome Summary.

 Pass %: 100
 Fail %: 0

 Undetermined %: 0
 Not Applicable %: 0

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