

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-1	ENV-1-a	Project has one building segment with two above-grade wall surfaces at different azimuth angles. Each wall has a window and the windows differ in area by more than 5%. Four sets of baseline model results are appropriately provided.	pass	rule5-1.json
ENV-1	ENV-1-b	Project has one building segment with two above-grade wall surfaces at different azimuth angles. Each wall has a window and the windows differ in area by less than 5%. One set of baseline model results is appropriately provided.	pass	rule5-1.json
ENV-1	ENV-1-c	Project has one building segment with two above-grade wall surfaces at different azimuth angles. Each wall has a window and the windows differ in area by more than 5%. One set of baseline model results is provided, when four sets are expected.	fail	rule5-1.json
ENV-10	ENV-10-a	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is established correctly.	pass	rule5-10.json
ENV-10	ENV-10-b	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on cooling capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is established correctly.	pass	rule5-10.json
ENV-10	ENV-10-c	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is not established correctly.	fail	rule5-10.json
ENV-10	ENV-10-d	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is established correctly.	pass	rule5-10.json
ENV-10	ENV-10-e	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is not established correctly.	fail	rule5-10.json
ENV-10	ENV-10-f	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is established correctly.	pass	rule5-10.json
ENV-10	ENV-10-g	Project has one building segment with an exterior floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is not established correctly.	fail	rule5-10.json
ENV-10	ENV-10-h	Project has one building segment with an exterior floor surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is established correctly.	pass	rule5-10.json
ENV-10	ENV-10-i	Project has one building segment with an exterior floor surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline floor U-factor for the zone is not established correctly.	fail	rule5-10.json
ENV-11	ENV-11-a	Project has one building segment with one zone and a single surface. The surface is not a slab-on-grade so this rule does not apply.	not_applicable	rule5-11.json
ENV-11	ENV-11-b	Project has one building segment with one zone and a single surface. The surface is a regulated slab-on-grade for which this rule cannot be fully evaluated.	undetermined	rule5-11.json
ENV-12	ENV-12-a	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade floor F-factor for the zone is established correctly.	pass	rule5-12.json
ENV-12	ENV-12-b	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on cooling capacity of the HVAC system that serves it. The baseline slab-on-grade floor F-factor for the space is established correctly.	pass	rule5-12.json
ENV-12	ENV-12-c	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline slab-on-grade floor F-factor for the space is not established correctly.	fail	rule5-12.json
ENV-12	ENV-12-d	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline slab-on-grade floor F-factor for the space is established correctly.	pass	rule5-12.json
ENV-12	ENV-12-e	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline slab-on-grade floor F-factor for the space is not established correctly.	undetermined	rule5-12.json
ENV-12	ENV-12-f	Project has one building segment with a slab-on-grade floor surface. A space is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. Building is located in climate zone 4A. The baseline slab-on-grade floor F-factor for the zone is established correctly.	pass	rule5-12.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-12	ENV-12-g	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade floor F-factor for the zone is not established correctly.	undetermined	rule5-12.json
ENV-12	ENV-12-h	Project has one building segment with a slab-on-grade floor surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade floor F-factor for the space is established correctly.	pass	rule5-12.json
ENV-12	ENV-12-i	Project has one building segment and includes one space with a slab-on-grade floor surface. Building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade floor F-factor for the space is not established correctly.	fail	rule5-12.json
ENV-13	ENV-13-a	Project has one building segment and includes one space with an exterior wall surface. The space is unconditioned based on heating and cooling capacity of the HVAC system that serves the parent zone. The baseline exterior envelope U-factor for the surface correctly matches the proposed.	pass	rule5-13.json
ENV-13	ENV-13-b	Project has one building segment and includes one space with an exterior wall surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline exterior envelope U-factor for the surface does not match the proposed.	fail	rule5-13.json
ENV-13	ENV-13-c	Project has one building segment and includes a space with an exterior wall surface. The space is semiheated based on heating capacity of the HVAC system that serves the parent zone. The baseline exterior envelope U-factor for the surface correctly matches the proposed.	pass	rule5-13.json
ENV-13	ENV-13-d	Project has one building segment and includes a space with an exterior wall surface. The space is semiheated based on heating capacity of the HVAC system that serves the parent zone. The baseline exterior envelope U-factor for the surface does not match the proposed.	fail	rule5-13.json
ENV-13	ENV-13-e	Project has one building segment and includes a space with a below-grade wall surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor correctly matches the proposed.	pass	rule5-13.json
ENV-13	ENV-13-f	Project has one building segment and includes a space with a below-grade wall surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor does not match the proposed.	fail	rule5-13.json
ENV-13	ENV-13-g	Project has one building segment and includes a space with a below-grade wall surface. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor correctly matches the proposed.	pass	rule5-13.json
ENV-13	ENV-13-h	Project has one building segment and includes a space with a below-grade wall surface. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor does not match the proposed.	fail	rule5-13.json
ENV-13	ENV-13-i	Project has one building segment and includes a space with a slab-on-grade floor surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade F-factor correctly matches the proposed.	pass	rule5-13.json
ENV-13	ENV-13-j	Project has one building segment and includes a space with a slab-on-grade floor surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade F-factor does not match the proposed.	fail	rule5-13.json
ENV-13	ENV-13-k	Project has one building segment and includes a space with a slab-on-grade floor surface. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade F-factor correctly matches the proposed.	pass	rule5-13.json
ENV-13	ENV-13-l	Project has one building segment and includes a space with a slab-on-grade floor surface. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline slab-on-grade F-factor does not match the proposed.	fail	rule5-13.json
ENV-14	ENV-14-a	Project has one building segment and includes a space that has two exterior walls with windows. The building is a new construction "school (primary)" building type and the space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Baseline fenestration area is established correctly.	pass	rule5-14.json
ENV-14	ENV-14-b	Project has one building segment and includes a space that has two exterior walls with windows. The building is a new construction "school (primary)" building type and the space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Baseline fenestration area is not established correctly.	fail	rule5-14.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-14	ENV-14-c	Project has one building segment and includes a space that has two exterior walls with windows. The building is an addition to existing "warehouse (nonrefrigerated)" building type and the space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. Baseline fenestration area is established correctly.	pass	rule5-14.json
ENV-14	ENV-14-d	Project has one building segment and includes a space that has two exterior walls with windows. The building is an addition to existing "warehouse (nonrefrigerated)" building type and the space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. Baseline fenestration area is not established correctly.	fail	rule5-14.json
ENV-15	ENV-15-a	Project has one building segment and includes a space that has two exterior walls with windows. The building is a new construction, the space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. and the building area type is not included in Table G3.1.1-1. Baseline fenestration area is established correctly.	pass	rule5-15.json
ENV-15	ENV-15-b	Project has one building segment and includes a space that has two exterior walls with windows. The building is new construction, the space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone, and the building area type is not included in Table G3.1.1-1. Baseline fenestration area is not established correctly.	fail	rule5-15.json
ENV-15	ENV-15-c	Project has one building segment and includes a space that has two exterior walls with windows. The building segment includes existing components and the building area type is not included in Table G3.1.1-1. The outcome cannot be determined.	undetermined	rule5-15.json
ENV-16	ENV-16-a	Project has one building segment and includes a zone that has two exterior walls with windows. Vertical fenestration area in the baseline model is distributed on each face in the same proportion as in the proposed design.	pass	rule5-16.json
ENV-16	ENV-16-b	Project has one building segment and includes a zone that has two exterior walls with windows. Vertical fenestration area in the baseline model is not distributed on each face in the same proportion as in the proposed design.	fail	rule5-16.json
ENV-17	ENV-17-a	Project has one building segment and includes a space whose status type is EXISTING. The status type is incorrectly modeled in the baseline.	undetermined	rule5-17.json
ENV-17	ENV-17-b	Project has one building segment and includes a space whose status type is ALTERED. The status type is incorrectly modeled in the baseline.	undetermined	rule5-17.json
ENV-17	ENV-17-c	Project has one building segment and includes a space whose status type is NEW. The status type is correctly modeled in the baseline.	not_applicable	rule5-17.json
ENV-18	ENV-18-a	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The skylight uses manually controlled dynamic shading, and the average SHGC and VT cannot be determined.	undetermined	rule5-18.json
ENV-18	ENV-18-b	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The skylight does not use manually controlled dynamic shading, so this rule does not apply.	not_applicable	rule5-18.json
ENV-19	ENV-19-a	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The vertical fenestration area is less than 10% of the gross exterior wall area. The baseline vertical fenestration U-factor is established correctly.	pass	rule5-19.json
ENV-19	ENV-19-b	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The vertical fenestration area is less than 10% of the gross exterior wall area. The baseline vertical fenestration U-factor is established correctly.	fail	rule5-19.json
ENV-19	ENV-19-c	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The vertical fenestration area is less than 10% of the gross exterior wall area. The baseline vertical fenestration U-factor is established correctly.	pass	rule5-19.json
ENV-19	ENV-19-d	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The vertical fenestration area is less than 10% of the gross exterior wall area. The baseline vertical fenestration U-factor is not established correctly.	fail	rule5-19.json
ENV-19	ENV-19-e	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space is semiheated based on heating and cooling capacity of the HVAC system that serves it. The vertical fenestration area is less than 10% of the gross exterior wall area. The baseline vertical fenestration U-factor is established correctly.	pass	rule5-19.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-19	ENV-19-f	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space is semiheated based on heating and cooling capacity of the HVAC system that serves it. The vertical fenestration area is less than 10% of the gross exterior wall area. The baseline vertical fenestration U-factor is established correctly.	fail	rule5-19.json
ENV-19	ENV-19-g	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 3C, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The baseline vertical fenestration U-factor is established correctly.	pass	rule5-19.json
ENV-19	ENV-19-h	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 3C, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The baseline vertical fenestration U-factor is not established correctly.	fail	rule5-19.json
ENV-2	ENV-2-a	Project has one building segment with two zones. Zones include both interior and exterior surfaces. All exterior surfaces are correctly modeled as not casting shade in the baseline.	not_applicable	rule5-2.json
ENV-2	ENV-2-b	Project has one building segment with two zones. Zones include both interior and exterior surfaces. One exterior surface is incorrectly modeled as casting shade in the baseline.	undetermined	rule5-2.json
ENV-20	ENV-20-a	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The WWR is less than 10% of the gross wall area. The baseline vertical fenestration SHGC is established correctly.	pass	rule5-20.json
ENV-20	ENV-20-b	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The WWR is less than 10% of the gross wall area. The baseline vertical fenestration SHGC is not established correctly.	fail	rule5-20.json
ENV-20	ENV-20-c	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The WWR is less than 10% of the gross wall area. The baseline vertical fenestration SHGC is established correctly.	pass	rule5-20.json
ENV-20	ENV-20-d	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The WWR is less than 10% of the gross wall area. The baseline vertical fenestration SHGC is not established correctly.	fail	rule5-20.json
ENV-20	ENV-20-e	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space is semiheated based on heating capacity of the HVAC system that serves it. The WWR is less than 10% of the gross wall area. The baseline vertical fenestration SHGC is established correctly.	pass	rule5-20.json
ENV-20	ENV-20-f	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 4A, the space is semiheated based on heating capacity of the HVAC system that serves it. The WWR is less than 10% of the gross wall area. The baseline vertical fenestration SHGC is not established correctly.	fail	rule5-20.json
ENV-20	ENV-20-g	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 3C, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The WWR is 20-30% of the gross wall area. The baseline vertical fenestration SHGC is established correctly.	pass	rule5-20.json
ENV-20	ENV-20-h	Project has one building segment and includes a space with an above-grade wall surface and window. The building is located in climate zone 3C, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. The WWR is 20-30% of the gross wall area. The baseline vertical fenestration SHGC is not established correctly.	fail	rule5-20.json
ENV-21	ENV-21-a	Project has one building segment and includes a space with an above-grade wall surface and window. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is correctly modeled with the same area, U-factor and SHGC as in the proposed design	pass	rule5-21.json
ENV-21	ENV-21-b	Project has one building segment and includes a space with an above-grade wall surface and window. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is incorrectly modeled with a different area than in the proposed design	fail	rule5-21.json
ENV-21	ENV-21-c	Project has one building segment and includes a space with an above-grade wall surface and window. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is modeled with a different u-factor than in the proposed design	fail	rule5-21.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-21	ENV-21-d	Project has one building segment and includes a space with an above-grade wall surface and window. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is modeled with a different SHGC than in the proposed design	fail	rule5-21.json
ENV-22	ENV-22-a	Project has one building segment and includes a space with an above-grade wall surface. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is modeled as flush with the exterior wall with no shading projections.	pass	rule5-22.json
ENV-22	ENV-22-b	Project has one building segment and includes a space with an above-grade wall surface. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is modeled as flush with the exterior wall with no shading projections.	fail	rule5-22.json
ENV-22	ENV-22-c	Project has one building segment and includes a space with an above-grade wall surface. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Fenestration is modeled as flush with the exterior wall and overhangs are specified, but the depth of overhang is 0.	pass	rule5-22.json
ENV-23	ENV-23-a	Project has one building segment and includes a space with an above-grade wall surface and window. The space has vertical fenestration with manual interior shading. Manual interior shades are correctly modeled the same in the baseline and proposed models.	pass	rule5-23.json
ENV-23	ENV-23-b	Project has one building segment and includes a space with an above-grade wall surface and window. The space has vertical fenestration with manual interior shading. Manual interior shades are not correctly modeled the same in the baseline and proposed models.	fail	rule5-23.json
ENV-24	ENV-24-a	Project has one building segment and includes a conditioned zone that has two roof surfaces one of which has skylights. Skylight area in the proposed design is less than 3% of total roof area. Baseline skylight area is correctly modeled as equal to the skylight area in the proposed design.	pass	rule5-24.json
ENV-24	ENV-24-b	Project has one building segment and includes a conditioned zone that has two roof surfaces one of which has skylights. Skylight area in the proposed design is less than 3% of the total roof area. Baseline skylight area is not equal to the skylight area in the proposed design, which is incorrect.	fail	rule5-24.json
ENV-25	ENV-25-a	Project has one building segment and includes a conditioned zone that has two roof surfaces one of which has skylights. Skylight area in the proposed design is greater than 3% of the total roof area. Baseline skylight area ratio reduced to 3%.	pass	rule5-25.json
ENV-25	ENV-25-b	Project has one building segment and includes a conditioned zone that has two roof surfaces one of which has skylights. Skylight area in the proposed design is greater than 3% of the total roof area. Baseline skylight area ratio is higher than 3%.	fail	rule5-25.json
ENV-26	ENV-26-a	Project has one building segment and includes a conditioned zone that has two roof surfaces both of which have skylights. Each baseline subsurface's proportion of the building's total glazed area is equal to the proposed.	pass	rule5-26.json
ENV-26	ENV-26-b	Project has one building segment and includes a conditioned zone that has two roof surfaces both of which have skylights. Each baseline subsurface's proportion of the building's total glazed area is not equal to the proposed.	fail	rule5-26.json
ENV-27	ENV-27-a	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space has residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is 0%-2.0%. The baseline skylight U-factor is established correctly.	pass	rule5-27.json
ENV-27	ENV-27-b	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space has residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is 0%-2.0%. The baseline skylight U-factor is not established correctly.	fail	rule5-27.json
ENV-27	ENV-27-c	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is 0%-2.0%. The baseline skylight U-factor is established correctly.	pass	rule5-27.json
ENV-27	ENV-27-d	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is 0%-2.0%. The baseline skylight U-factor is not established correctly.	fail	rule5-27.json
ENV-27	ENV-27-e	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space is semiheated based on heating capacity of the HVAC system that serves it. Skylight area in the building is 0%-2.0%. The baseline skylight U-factor is established correctly.	pass	rule5-27.json
ENV-27	ENV-27-f	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 4A, the space is semiheated based on heating capacity of the HVAC system that serves it. Skylight area in the building is 0%-2.0%. The baseline skylight U-factor is not established correctly.	fail	rule5-27.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-27	ENV-27-g	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 3C, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is greater than 2.0%. The baseline skylight U-factor is established correctly.	pass	rule5-27.json
ENV-27	ENV-27-h	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 3C, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is greater than 2.0%. The baseline skylight U-factor is not established correctly.	fail	rule5-27.json
ENV-28	ENV-28-a	Project has one building segment with 1 zones containing 2 spaces and a roof surface with a skylight. The building is located in climate zone 6A, the surface is EXTERIOR MIXED based on space types in the zone and the adjacency to exterior. Rule cannot be evaluated because the baseline requirements for residential and nonresidential differ.	undetermined	rule5-28.json
ENV-28	ENV-28-b	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 6A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is greater than 2.0%. The baseline skylight SHGC-factor is established correctly.	pass	rule5-28.json
ENV-28	ENV-28-c	Project has one building segment and includes a space with a roof surface and a skylight. The building is located in climate zone 6A, the space has non-residential occupancy type and is conditioned based on heating and cooling capacity of the HVAC system that serves it. Skylight area in the building is greater than 2.0%. The baseline skylight SHGC-factor is not established correctly.	fail	rule5-28.json
ENV-29	ENV-29-a	Project has one building segment and includes a space with a roof surface. The baseline roof emittance is correctly set to 0.9	pass	rule5-29.json
ENV-29	ENV-29-b	Project has one building segment and includes a space with a roof surface. The baseline roof emittance is incorrectly set to 0.5	fail	rule5-29.json
ENV-3	ENV-3-a	Project has one building segment with one zone and a single surface. The surface is not a roof so this rule does not apply.	not_applicable	rule5-3.json
ENV-3	ENV-3-b	Project has one building segment with one zone and a single surface. The surface is a regulated exterior roof for which this rule cannot be fully evaluated.	undetermined	rule5-3.json
ENV-30	ENV-30-a	Project has one building segment and includes a space with a roof surface. The roof surface thermal emittance in the proposed and user models is equal to 0.9	pass	rule5-30.json
ENV-30	ENV-30-b	Project has one building segment and includes a space with a roof surface. The roof surface thermal emittance in the proposed and user models is equal to 0.7	undetermined	rule5-30.json
ENV-30	ENV-30-c	Project has one building segment and includes a space with a roof surface. The roof surface thermal emittance in the proposed model is equal to 0.9, but the roof surface thermal emittance in the user model is equal to 0.7.	pass	rule5-30.json
ENV-30	ENV-30-d	Project has one building segment and includes a space with a roof surface. The roof surface thermal emittance in the proposed model is equal to 0.5, but the roof surface thermal emittance in the user model is equal to 0.7.	fail	rule5-30.json
ENV-31	ENV-31-a	Project has one building segment and includes a space with a roof surface. The baseline roof emittance is correctly set to 0.9	pass	rule5-31.json
ENV-31	ENV-31-b	Project has one building segment and includes a space with a roof surface. The baseline roof emittance is incorrectly set to 0.5	fail	rule5-31.json
ENV-32	ENV-32-a	Project has one building segment and includes a space with a roof surface. The roof surface solar reflectance in the proposed and user models is equal to 0.3	pass	rule5-32.json
ENV-32	ENV-32-b	Project has one building segment and includes a space with a roof surface. The roof surface solar reflectance in the proposed and user models is equal to 0.7	undetermined	rule5-32.json
ENV-32	ENV-32-c	Project has one building segment and includes a space with a roof surface. The roof surface solar reflectance in the proposed model is equal to 0.3, but the roof surface thermal emittance in the user model is equal to 0.7.	pass	rule5-32.json
ENV-32	ENV-32-d	Project has one building segment and includes a space with a roof surface. The roof surface solar reflectance in the proposed model is equal to 0.5, but the roof surface thermal emittance in the user model is equal to 0.7.	fail	rule5-32.json
ENV-33	ENV-33-a	Project has one building segment. "weather_driven" infiltration modeling method is used	pass	rule5-33.json
ENV-33	ENV-33-b	Project has one building segment. "pressure_based" infiltration modeling method is used	pass	rule5-33.json
ENV-33	ENV-33-c	Project has one building segment. "constant" infiltration modeling method is used	fail	rule5-33.json
ENV-34	ENV-34-a	Project has one building segment. The proposed infiltration modeling method is the same as the baseline infiltration modeling method	pass	rule5-34.json
ENV-34	ENV-34-b	Project has one building segment. The proposed infiltration modeling method is the same as the baseline infiltration modeling method	fail	rule5-34.json
ENV-35	ENV-35-a	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate @75PA is established correctly.	pass	rule5-35.json
ENV-35	ENV-35-b	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate @75PA is not established correctly.	fail	rule5-35.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-35	ENV-35-c	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate at wind pressure is established correctly.	pass	rule5-35.json
ENV-35	ENV-35-d	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate at wind pressure is not established correctly.	fail	rule5-35.json
ENV-35	ENV-35-e	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate @75PA is established correctly.	pass	rule5-35.json
ENV-35	ENV-35-f	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate @75PA is not established correctly.	fail	rule5-35.json
ENV-35	ENV-35-g	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate at wind pressure is established correctly.	pass	rule5-35.json
ENV-35	ENV-35-h	Project has one building segment with one space that includes two surfaces - one adjacent to exterior and another adjacent to ground. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The baseline infiltration flow rate at wind pressure is not established correctly.	fail	rule5-35.json
ENV-36	ENV-36-a	Project has one building segment with one space that includes an exterior wall surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Air leakage rate at wind pressure in unenclosed and unconditioned spaces is the same in the proposed design as in the user model	pass	rule5-36.json
ENV-36	ENV-36-b	Project has one building segment with one space that includes an exterior wall surface. The space is unconditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. Air leakage rate at wind pressure in unenclosed and unconditioned spaces is not the same in the proposed design as in the user model	fail	rule5-36.json
ENV-37	ENV-37-a	Project has one building segment with one space that includes a roof surface with a skylight subsurface. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The proposed infiltration flow rate at wind pressure is established correctly based on default 0.6 cfm/ft2 @75PA.	pass	rule5-37.json
ENV-37	ENV-37-b	Project has one building segment with one space that includes a roof surface with a skylight subsurface. The space is conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The proposed infiltration flow rate at wind pressure is not based on default 0.6 cfm/ft2 @75PA. Manual check required to verify that site measurements were performed	undetermined	rule5-37.json
ENV-37	ENV-37-c	Project has one building segment with one space that includes a roof surface with a skylight subsurface. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The proposed infiltration flow rate at wind pressure is established correctly based on default 0.6 cfm/ft2 @75PA.	pass	rule5-37.json
ENV-37	ENV-37-d	Project has one building segment with one space that includes a roof surface with a skylight subsurface. The space is semiheated based on the heating capacity of the HVAC system that serves the parent zone. The proposed infiltration flow rate at wind pressure is not based on default 0.6 cfm/ft2 @75PA.	fail	rule5-37.json
ENV-38	ENV-38-a	Project has one building segment with one space that does not include any floor surfaces adjacent to ground. This rule does not apply to the project.	not_applicable	rule5-38.json
ENV-38	ENV-38-b	Project has one building segment with one space that includes floor surfaces adjacent to ground. The ruleset project description specifies a ground temperature schedule, but cannot be determined if it is representative of the project climate or if it was used in the calculation of heat loss.	undetermined	rule5-38.json
ENV-38	ENV-38-c	Project has one building segment with one space that includes floor surfaces adjacent to ground. The ruleset project description does not specify a ground temperature schedule.	undetermined	rule5-38.json
ENV-39	ENV-39-a	Project has one building segment with one space that includes a wall surface with a nonswinging door subsurface. The space is residential and conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline door u-factor is correctly established per Tables G3.4-1 through G3.4-8.	pass	rule5-39.json
ENV-39	ENV-39-b	Project has one building segment with 1 zones containing 2 spaces and a wall surface with a metal coiling door. The building is located in climate zone 8, the surface is EXTERIOR MIXED based on space types in the zone and the adjacency to exterior. All available options for baseline U-factor are the same, but baseline door u-factor does not align and is more conservative.	fail	rule5-39.json
ENV-39	ENV-39-c	Project has one building segment with one space that includes a wall surface with a metal coiling door. The space is nonresidential and conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline door u-factor does not align with either of the available options per Tables G3.4-1 through G3.4-8.	fail	rule5-39.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-39	ENV-39-d	Project has one building segment with one space that includes a wall surface with a metal coiling door. The space is nonresidential and conditioned based on the heating and cooling capacity of the HVAC system that serves the parent zone. The baseline door u-factor aligns with one of the available options per Tables G3.4-1 through G3.4-8, but cannot be determined if it is correct.	undetermined	rule5-39.json
ENV-4	ENV-4-a	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A, includes a space that has residential occupancy type, and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is established correctly.	pass	rule5-4.json
ENV-4	ENV-4-b	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A, includes a space that has residential occupancy type, and is conditioned based on cooling capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is established correctly.	pass	rule5-4.json
ENV-4	ENV-4-c	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A, includes a space that has residential occupancy type, and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is not established correctly.	fail	rule5-4.json
ENV-4	ENV-4-d	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is established correctly.	pass	rule5-4.json
ENV-4	ENV-4-e	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is not established correctly.	fail	rule5-4.json
ENV-4	ENV-4-f	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the the parent zone. The baseline roof U-factor for the space is established correctly.	pass	rule5-4.json
ENV-4	ENV-4-g	Project has one building segment with an exterior roof surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the the parent zone. The baseline roof U-factor for the space is not established correctly.	fail	rule5-4.json
ENV-4	ENV-4-h	Project has one building segment with an exterior roof surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is established correctly.	pass	rule5-4.json
ENV-4	ENV-4-i	Project has one building segment with an exterior roof surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline roof U-factor for the space is not established correctly.	fail	rule5-4.json
ENV-40	ENV-40-a	Project has one building segment with one space that includes an unregulated roof surface. The baseline roof optical properties are the same as in the proposed design.	pass	rule5-40.json
ENV-40	ENV-40-b	Project has one building segment with one space that includes an unregulated roof surface. The baseline roof optical properties are the different from the proposed design.	fail	rule5-40.json
ENV-40	ENV-40-c	Project has one building segment with one space that includes an unregulated roof surface. The proposed roof optical properties are not specified.	undetermined	rule5-40.json
ENV-5	ENV-5-a	Project has one building segment with one zone and a single surface. The surface is not a below grade wall so this rule does not apply.	not_applicable	rule5-5.json
ENV-5	ENV-5-b	Project has one building segment with one zone and a single surface. The surface is a regulated below grade wall for which this rule cannot be fully evaluated.	undetermined	rule5-5.json
ENV-6	ENV-6-a	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor for the zone is established correctly.	pass	rule5-6.json
ENV-6	ENV-6-b	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on cooling capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor for the space is established correctly.	pass	rule5-6.json
ENV-6	ENV-6-c	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor for the zone is not established correctly.	fail	rule5-6.json
ENV-6	ENV-6-d	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline below-grade wall C-factor for the zone is established correctly.	pass	rule5-6.json
ENV-6	ENV-6-e	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline below-grade wall C-factor for the zone is not established correctly.	fail	rule5-6.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
ENV-6	ENV-6-f	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A, includes a space that has residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor for the zone is established correctly.	pass	rule5-6.json
ENV-6	ENV-6-g	Project has one building segment with a below-grade wall surface. Building is located in climate zone 4A, includes a space that has residential occupancy type and is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. The baseline below-grade wall C-factor for the zone is not established correctly.	fail	rule5-6.json
ENV-6	ENV-6-h	Project has one building segment with a below-grade wall surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline below-grade wall C-factor for the zone is established correctly.	pass	rule5-6.json
ENV-6	ENV-6-i	Project has one building segment with a below-grade wall surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves it. The baseline below-grade wall C-factor for the zone is not established correctly.	fail	rule5-6.json
ENV-7	ENV-7-a	Project has one building segment with one zone and a single surface. The surface is not an above grade wall so this rule does not apply.	not_applicable	rule5-7.json
ENV-7	ENV-7-b	Project has one building segment with one zone and a single surface. The surface is a regulated above grade wall for which this rule cannot be fully evaluated.	undetermined	rule5-7.json
ENV-8	ENV-8-a	Project has one building segment with an above-grade wall surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is established correctly.	pass	rule5-8.json
ENV-8	ENV-8-b	Project has one building segment with an above-grade wall surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on cooling capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is established correctly.	pass	rule5-8.json
ENV-8	ENV-8-c	Project has one building segment with an above-grade wall surface. Building is located in climate zone 4A and includes a space that has residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is not established correctly.	fail	rule5-8.json
ENV-8	ENV-8-d	Project has one building segment with an above-grade wall surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is established correctly.	pass	rule5-8.json
ENV-8	ENV-8-e	Project has one building segment with an above-grade wall surface. Building is located in climate zone 4A and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is not established correctly.	fail	rule5-8.json
ENV-8	ENV-8-f	Project has one building segment with an above-grade wall surface. A zone is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. Building is located in climate zone 4A. The baseline above-grade wall U-factor for the zone is established correctly.	pass	rule5-8.json
ENV-8	ENV-8-g	Project has one building segment with an above-grade wall surface. A zone is semiheated based on heating and cooling capacity of the HVAC system that serves the parent zone. Building is located in climate zone 4A. The baseline above-grade wall U-factor for the zone is not established correctly.	fail	rule5-8.json
ENV-8	ENV-8-h	Project has one building segment with an above-grade wall surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is established correctly.	pass	rule5-8.json
ENV-8	ENV-8-i	Project has one building segment with an above-grade wall surface. Building is located in climate zone 8 and includes a space that has non-residential occupancy type and is conditioned based on heating capacity of the HVAC system that serves the parent zone. The baseline above-grade wall U-factor for the zone is not established correctly.	fail	rule5-8.json
ENV-9	ENV-9-a	Project has one building segment with one zone and a single surface. The surface is not a floor so this rule does not apply.	not_applicable	rule5-9.json
ENV-9	ENV-9-b	Project has one building segment with one zone and a single surface. The surface is a regulated floor for which this rule cannot be fully evaluated.	undetermined	rule5-9.json
LTG-1	LTG-1-a	Project has one building segment with two spaces. Both lighting_building_area_type and lighting space type have been specified. The proposed building segment design lighting wattage is less than or equal to the maximum value of the allowable lighting power density multiplies total building segment area and space-by-space allowable lighting wattage. Expected result: PASS	pass	rule6-1.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
LTG-1	LTG-1-b	Project has one building segment with two spaces. Both lighting_building_area_type and lighting space type have been specified. The proposed building segment design lighting wattage is greater than the maximum value of the allowable lighting power density multiplies total building segment area and space-by-space allowable lighting wattage. Expected result: FAIL	fail	rule6-1.json
LTG-1	LTG-1-c	Project has one building segment with two spaces. Lighting_building_area_type hasn't been specified, and lighting space type has been specified. The proposed building segment design lighting wattage is less than or equal to space-by-space allowable lighting wattage. Expected result: PASS	pass	rule6-1.json
LTG-1	LTG-1-d	Project has one building segment with two spaces. Lighting_building_area_type hasn't been specified, and lighting space type has been specified. The proposed building segment design lighting wattage is greater than space-by-space allowable lighting wattage. Expected result: FAIL	fail	rule6-1.json
LTG-1	LTG-1-e	Project has one building segment with two spaces. Lighting_building_area_type has been specified and lighting space type hasn't been specified. The proposed building segment design lighting wattage is less than or equal to the allowable lighting power density multiplies total building segment area. Expected result: PASS	pass	rule6-1.json
LTG-1	LTG-1-f	Project has one building segment with two spaces. Lighting_building_area_type has been specified and lighting space type hasn't been specified. The proposed building segment design lighting wattage is greater than the allowable lighting power density multiplies the total building segment area. Expected result: FAIL	fail	rule6-1.json
LTG-1	LTG-1-g	Project has one building segment with two spaces. Both Lighting_building_area_type and lighting space type haven't been specified. Expected result: FAIL	fail	rule6-1.json
LTG-2	LTG-2-a	Project has one building segment with two spaces. Both lighting power per area and lighting power allowance have been specified. The proposed building lighting power per area equals the maximum value of the proposed building's lighting power allowance and user building's lighting power per area. Expected result: PASS	pass	rule6-2.json
LTG-2	LTG-2-b	Project has one building segment with two spaces. Both lighting power per area and lighting power allowance have been specified. The proposed building lighting power per area doesn't equal the maximum value of the proposed building's lighting power allowance and user building's lighting power per area. Expected result: FAIL	fail	rule6-2.json
LTG-2	LTG-2-c	Project has one building segment with two spaces. Both lighting power per area and lighting power allowance have been specified. The proposed building lighting power per area equals the maximum value of the proposed building's lighting power allowance and user building's lighting power per area. The space type is "Dwelling Unit". Expected result: PASS	pass	rule6-2.json
LTG-2	LTG-2-d	Project has one building segment with two spaces. Both lighting power per area and lighting power allowance have been specified. The proposed building lighting power per area equals the maximum value of the proposed building's lighting power allowance and user building's lighting power per area. The space type is "LIBRARY_READING_AREA". Expected result: not-applicable	not_applicable	rule6-2.json
LTG-3	LTG-3-a	Project has one building segment with one zone with two spaces. The lighting power density in the proposed ruleset project description is the same as the lighting power density in the user ruleset project description for all spaces in the building. Expected result: PASS	pass	rule6-3.json
LTG-3	LTG-3-b	Project has one building segment with one zone with two spaces. The lighting power density in the proposed ruleset project description is not the same as the lighting power density in the user ruleset project description for all spaces in the building. Expected result: FAIL	fail	rule6-3.json
LTG-3	LTG-3-c	Project has one building segment with one zone with two spaces. The lighting power density in the proposed ruleset project description is not the same as the lighting power density in the user ruleset project description for all spaces in the building. P ruleset project description LPD matches Standard 90.1-2019 Table 9.5.1. Expected result: undetermined	undetermined	rule6-3.json
LTG-4	LTG-4-a	Project has one building segment with one zone and one space. The lighting system is as-designed or as-existing but the lighting space type has not been specified in the baseline ruleset project description. The lighting power density in the baseline ruleset project description cannot be verified. Expected result: FAIL	fail	rule6-4.json
LTG-4	LTG-4-b	Project has one building segment with one zone and one space. The lighting system is as-designed or as-existing and the lighting space type has been specified in the baseline ruleset project description. The lighting power density in the baseline ruleset project description is equal to the value specified in Standard 90.1-2019 Table G3.7 for the specified lighting space type. Expected result: PASS	pass	rule6-4.json
LTG-4	LTG-4-c	Project has one building segment with one zone and one space. The lighting system is as-designed or as-existing and the lighting space type has been specified in the baseline ruleset project description. The lighting power density in the baseline ruleset project description is not equal to the value specified in Standard 90.1-2019 Table G3.7 for the specified lighting space type. Expected result: FAIL	fail	rule6-4.json
LTG-4	LTG-4-d	Project has one building segment with one zone and one space. The lighting system is not-yet-designed and the lighting space type has not been specified in the baseline ruleset project description. The lighting power density in the baseline ruleset project description is equal to the value specified in Standard 90.1-2019 Table G3.7 for the lighting systems not-yet-designed. Expected result: PASS	pass	rule6-4.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
LTG-4	LTG-4-e	Project has one building segment with one zone and one space. The lighting system is not-yet-designed and the lighting space type has not been specified in the baseline ruleset project description. The lighting power density in the baseline ruleset project description is not equal to the value specified in Standard 90.1-2019 Table G3.7 for the lighting systems not-yet-designed. Expected result: FAIL	fail	rule6-4.json
LTG-5	LTG-5-a	Project has one building segment with one zone and one space. The building gross floor area is 5200 ft2. Baseline building > 5000 ft2 is modeled with automatic shutoff controls. Expected result: PASS	pass	rule6-5.json
LTG-5	LTG-5-b	Project has one building segment with one zone and two spaces. Baseline building > 5000 ft2 is not modeled with automatic shutoff controls, contrary to rule requirement. Expected result: FAIL	fail	rule6-5.json
LTG-5	LTG-5-c	Project has one building segment with one zone and two spaces. Baseline building is < 5000 ft2 is not modeled with automatic shutoff controls. Expected result: not-applicable	not_applicable	rule6-5.json
LTG-6	LTG-6-a	The baseline building has NONE daylighting control type. Expected result: PASS	pass	rule6-6.json
LTG-6	LTG-6-b	The baseline building has STEPPED daylighting control type. Expected result: FAIL	fail	rule6-6.json
LTG-7	LTG-7-a	The project has one building segment with one zone and one space. The zone has a window subsurface and the interior lighting has daylighting control. Schedules are not used to model daylight schedules. Expected result: undetermined	undetermined	rule6-7.json
LTG-7	LTG-7-b	The project has one building segment with one zone and one space. The zone has two windows. The interior lighting has daylighting control, and schedules are used to model daylight schedules. Expected result: undetermined	undetermined	rule6-7.json
LTG-7	LTG-7-c	The project has one building segment with one zone and one space. The zone has two windows. The interior lighting doesn't have daylighting control, and schedules are not used to model daylight schedules. Expected result: FAIL	fail	rule6-7.json
LTG-7	LTG-7-d	The project has one building segment with one zone and one space. The building has a door subsurface and no windows, the interior lighting has daylighting control, and schedules are not used to model daylight schedules. Expected result: FAIL	fail	rule6-7.json
LTG-7	LTG-7-e	The project has one building segment with one zone and one space. The zone has only interior walls. The building doesn't have a door subsurface, the interior lighting doesn't have daylighting control, and schedules are not used to model daylight schedules. Expected result: PASS	pass	rule6-7.json
LTG-8	LTG-8-a	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.625, and the baseline building lighting schedule has values of 1. The space type is Office - Enclosed. Expected result: PASS	pass	rule6-8.json
LTG-8	LTG-8-b	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.25, and the baseline building lighting schedule has values of 0.625. The space type is Office - Enclosed. Expected result: FAIL	fail	rule6-8.json
LTG-8	LTG-8-d	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.75, and the baseline building lighting schedule has values of 0.25. The space type is Office - Enclosed. Expected result: Undetermined	undetermined	rule6-8.json
LTG-8	LTG-8-e	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.6875, and the baseline building lighting schedule has values of 1. The space type is LOBBY_ALL_OTHERS. Expected result: PASS	pass	rule6-8.json
LTG-8	LTG-8-f	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.25, and the baseline building lighting schedule has values of 0.75. The space type is LOBBY_ALL_OTHERS. Expected result: FAIL	fail	rule6-8.json
LTG-8	LTG-8-g	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.7, and the baseline building lighting schedule has values of 1. The space type is Office - Enclosed. Daylight control type is FULL_AUTO_ON. Expected result: PASS	pass	rule6-8.json
LTG-8	LTG-8-h	The project has one building segment with one zone and one space with one InteriorLighting. The proposed building lighting schedule has values of 0.25, and the baseline building lighting schedule has values of 0.625. The space type is Office - Enclosed. Daylight control type is FULL_AUTO_ON. Expected result: FAIL	fail	rule6-8.json
LTG-9	LTG-9-a	The project has one building segment with one zone and one space. Will test Case 1: If space does not model any daylight control using schedule, and normalized space lighting schedule in proposed ruleset project description is equal to that in baseline ruleset project description. Expected result: PASS	pass	rule6-9.json
LTG-9	LTG-9-b	The project has one building segment with one zone and one space. Will test Case 2: Else if space does not model any daylight control, and normalized space lighting schedule in proposed ruleset project description is not equal to that in baseline ruleset project description. Expected result: FAIL	fail	rule6-9.json
LTG-9	LTG-9-c	The project has one building segment with one zone and one space. Will test Case 3: Else, space models at least one daylight control using schedule. Expected result: UNDETERMINED	undetermined	rule6-9.json
HVAC_SYS-1	HVAC_SYS-1-a	The project has one building segment with one zone and one floor with HVAC building area type = public assembly. It is 60,000 ft2 and has HVAC system type 4 and is in climate zone 3A	pass	rule18-1.json

[illegible]

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_SYS-1	HVAC_SYS-1-ab	The project has one building segment with four zones and one floor with HVAC building area type = Other Non-Residential. It is 40,000 ft2 and has HVAC system type 5. It is in climate zone 6A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ac	The project has one building segment with four zones and one floor with HVAC building area type = Other Non-Residential. It is 40,000 ft2 and has HVAC system type 6. It is in climate zone 6A	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ad	The project has one building segment with six zones and six floors with HVAC building area type = Other Non-Residential. It is 60,000 ft2 and has HVAC system type 8. It is in climate zone 3A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ae	The project has one building segment with six zones and six floors with HVAC building area type = Other Non-Residential. It is 60,000 ft2 and has HVAC system type 5. It is in climate zone 3A	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-af	The project has one building segment with four zones and one floor with HVAC building area type = Other Non-Residential. It is 160,000 ft2 and has HVAC system type 8. It is in climate zone 3A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ag	The project has one building segment with six zones and six floors with HVAC building area type = Other Non-Residential. It is 60,000 ft2 and has HVAC system type 7. It is in climate zone 5A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ah	The project has one building segment with six zones and six floors with HVAC building area type = Other Non-Residential. It is 60,000 ft2 and has HVAC system type 5. It is in climate zone 5A	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ai	The project has one building segment with four zones and one floor with HVAC building area type = Other Non-Residential. It is 160,000 ft2 and has HVAC system type 7. It is in climate zone 5A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-aj	The project has one building segment with six zones and six floors with HVAC building area type = Other Non-Residential for Thermal Zone 1 and HVAC building area type = HOSPITAL for the other five zones. Thermal Zone 1 is 25,000 ft2 and the other zones are 20,000 sf each. It is in climate zone 3A. Thermal zone 1 is correctly conditioned with HVAC system type 8	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ak	The project has one building segment with six zones and six floors with HVAC building area type = Other Non-Residential for Thermal Zone 1 and HVAC building area type = HOSPITAL for the other five zones. Thermal Zone 1 is 25,000 ft2 and the other zones are 20,000 sf each. It is in climate zone 3A. Thermal zone 1 is incorrectly conditioned with HVAC system type 6	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-al	The project has one building segment with one zone and one floor with HVAC building area type = RESIDENTIAL. It is in climate zone 3A and is correctly modeled with HVAC system type 2	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-am	The project has one building segment with one zone and one floor with HVAC building area type = RESIDENTIAL. It is in climate zone 3A and is incorrectly modeled with HVAC system type 3	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-an	The project has one building segment with one zone and one floor with HVAC building area type = RESIDENTIAL. It is in climate zone 4A and is correctly modeled with HVAC system type 1	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ao	The project has one building segment with one zone and one floor with HVAC building area type = RESIDENTIAL. It is in climate zone 4A and is incorrectly modeled with HVAC system type 3	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ap	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 50,000 sf, so the baseline system type is system 5. Thermal Zone 1 has peak internal gains that differ by more than 10 Btu/h.ft2. It is in climate zone 4A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-aq	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 50,000 sf, so the baseline system type is system 5. Thermal Zone 1 has peak internal gains that differ by more than 10 Btu/h.ft2 and is incorrectly modeled with System type 8. It is in climate zone 4A	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ar	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 50,000 sf, so the baseline system type is system 6. Thermal Zone 1 has peak internal gains that differ by more than 10 Btu/h.ft2. It is in climate zone 1A	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-as	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 50,000 sf, so the baseline system type is system 6. Thermal Zone 1 has peak internal gains that differ by more than 10 Btu/h.ft2 and is incorrectly modeled with System type 5. It is in climate zone 1A	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-at	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 40,000 sf. Thermal Zone 1 is type Laboratory with 16,000 cfm of zone exhaust and HVAC system type 5. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-au	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zone 1 is type Laboratory with 16,000 cfm of zone exhaust and HVAC system type 7. Expected result: pass	pass	rule18-1.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_SYS-1	HVAC_SYS-1-av	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 640,000 sf. Thermal Zones 1 and 2 are type Laboratory with total 16,000 cfm of zone exhaust and HVAC system type 5. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-aw	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 20,000 sf. Thermal Zone 1 is type Laboratory with 16,000 cfm of zone exhaust and incorrectly modeled as being on the same System 6 as the rest of the zones. Expected result: fail	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ax	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zone 1 is type Laboratory with 12,000 cfm of zone exhaust and is incorrectly modeled with a dedicated HVAC system type 7. Expected result: fail	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ay	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zones 1 and 2 are type Laboratory. They are served by one System 7 with total exhaust rate of 16,000cfm. Expected result: undetermiend	undetermined	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-az	The project has one building segment with one floor and one zone with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 500 sf. Thermal Zones 1 is a stairwell with a heating-only system. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-ba	The project has one building segment with one floor and one zone with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 500 sf. Thermal Zones 1 is a stairwell with a heating-only system. There is a cooling system in the proposed model. Expected result: fail	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bb	The project has one building segment with one floor and four zones with HVAC building area type = HEATED_ONLY_STORAGE. Building area is 20,000 sf. Thermal Zone 1 is a warehouse with a heating-only system. Thermal Zones 2,3&4 are office with HVAC Sys-4 Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bc	The project has one building segment with one floor and four zones with HVAC building area type = HEATED_ONLY_STORAGE. Building area is 20,000 sf. Thermal Zone 1 is a warehouse with a heating-only system. Thermal Zones 2,3&4 are office. Only thermal zones 3&4 have HVAC Sys-3. Thermal Zone 2 is incorrectly modeled with Sys-9 in the baseline despite having a DX coil in the proposed model Expected result: fail	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bd	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 7. Building area is 160,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM with a peak cooling load greater than 650,000btu/hr and has HVAC system type 11. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-be	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 7. Building area is 160,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM,peak cooling load of 650,000btu/hr and is on the System 7. Expected result: fail	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bf	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 5. Building area is 120,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM with a peak cooling load greater than 3,000,000btu/hr and has HVAC system type 11. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bg	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 5. Building area is 120,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM with a peak cooling load greater than 3,000,000btu/hr and is incorrectly modeled as being on the predominant hvac system 5. Expected result: fail	fail	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bh	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 5. Building area is 120,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM with a peak cooling load less than 3,000,000btu/hr and is modeled as being on the predominant hvac system 5. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bi	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 7. Building area is 160,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM,peak cooling load of less than 650,000btu/hr and has HVAC system type 3. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bj	The project has one building segment with one floor and four zones in climate zone 1A with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 7. Building area is 160,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM,peak cooling load of less than 650,000btu/hr and has HVAC system type 4. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bk	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER NON RESIDENTIAL. Predominant HVAC type is System 7. Building area is 160,000 sf. Thermal Zone 1 has a lighting space type COMPUTER_ROOM,peak cooling load of less than 650,000btu/hr and has HVAC system type 3. Expected result: fail	fail	rule18-1.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_SYS-1	HVAC_SYS-1-bl	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 20,000 sf. The buidling is modeled with each zone having its own HVAC system type 3. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bm	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 20,000 sf. The buidling is modeled incorrectly with all zones being served by one HVAC system type 3. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bn	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. The buidling is modeled with each floor having its own HVAC system type 7. Expected result: pass	pass	rule18-1.json
HVAC_SYS-1	HVAC_SYS-1-bo	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. The buidling is modeled incorrectly with one HVAC System 9 serving all zones. Expected result: fail	fail	rule18-1.json
HVAC_SYS-2	HVAC_SYS-2-a	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = RESIDENTIAL. The building is correctly modeled with Separate HVAC System 1 serving each zone. Expected result: pass	pass	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-b	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = RESIDENTIAL. The building is incorrectly modeled with multiple zones served by HVAC System 1a. Expected result: fail	fail	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-c	The project has one building segment with one floor and four zones in climate zone 1A with HVAC building area type = RETAIL. The building is correctly modeled with one HVAC system 4 serving each zone. Expected result: pass	pass	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-d	The project has one building segment with one floor and four zones in climate zone 1A with HVAC building area type = RETAIL. The building is incorrectly modeled with one HVAC system 5b per floor. Expected result: fail	fail	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-e	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER_NON_RESIDENTIAL. The building area is 50,000 sf. The building is correctly modeled with one HVAC system 5 per floor. Expected result: pass	pass	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-f	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER_NON_RESIDENTIAL. The building area is 50,000 sf. The building is incorrectly modeled with one HVAC system for the whole building. Expected result: fail	fail	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-g	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER_NON_RESIDENTIAL. The building area is 50,000 sf. The building has two laboratory zones with a total lab exhaust rate of 16,000 cfm. The two exhaust zones are correctly served by one System 5 HVAC system. The other two zones are each served by a System 5 HVAC system (one per floor). Expected result: pass	pass	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-h	The project has one building segment with one floor and four zones in climate zone 4A with HVAC building area type = OTHER_NON_RESIDENTIAL. The building area is 50,000 sf. The building has two laboratory zones with a total lab exhaust rate of 12,000 cfm. The two exhaust zones are served by one System 5 HVAC system. The other two zones are each served by a System 5 HVAC system (one per floor). We expect an undetermined result because with a lab exhaust rate of 12,000 cfm, and 4,000cfm of system exhaust, it is not possible to tell if there is more than 15,000cfm of lab exhaust. Expected result: undetermined	undetermined	rule18-2.json
HVAC_SYS-2	HVAC_SYS-2-i	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zones 1 and 2 are type Laboratory with total 12,000 cfm of zone exhaust. The building is modeled with one HVAC system 7b per floor and incorrectly with one HVAC system 7 for the Laboratory zones. Expected result: fail	fail	rule18-2.json
HVAC_SYS-3	HVAC_SYS-3-a	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zones 1 and 2 are type Laboratory with total 16,000 cfm of zone exhaust. Expected result: undetermined	undetermined	rule18-3.json
HVAC_SYS-3	HVAC_SYS-3-b	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zones 1 and 2 are type Laboratory with total 8,000 cfm of zone exhaust. Expected result: not applicable	not_applicable	rule18-3.json
HVAC_SYS-3	HVAC_SYS-3-c	The project has one building segment with one floor and four zones with HVAC building area type = OTHER NON RESIDENTIAL. Building area is 160,000 sf. Thermal Zones 1 and 2 are NOT type Laboratory with total 16,000 cfm of zone exhaust. Expected result: not applicable	not_applicable	rule18-3.json
HVAC_GEN-1	HVAC_GEN-1-a	The project has one building segment with one zone. System 3 correctly utilizes autosized furnace with 25% oversizing and autosized DX coil with 15% oversizing. Expected outcome: PASS	pass	rule19-1.json
HVAC_GEN-1	HVAC_GEN-1-b	The project has one building segment with one zone. Airside HVAC has no cooling coil. It correctly utilizes an autosized furnace with 25% oversizing. Cooling side oversizing is not applicable. Expected outcome: PASS	pass	rule19-1.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-1	HVAC_GEN-1-c	The project has one building segment with one zone. Airside HVAC has no heating coil. It correctly utilizes an autosized DX coil with 15% oversizing. Heating side oversizing is not applicable. Expected outcome: PASS	pass	rule19-1.json
HVAC_GEN-1	HVAC_GEN-1-d	The project has one building segment with one zone. System 3 incorrectly utilizes autosized furnace with no oversizing and autosized DX coil with no oversizing. Expected outcome: FAIL	fail	rule19-1.json
HVAC_GEN-1	HVAC_GEN-1-e	The project has one building segment with one zone. Airside HVAC has no cooling coil. This test falls into NOT APPLICABLE case since it has OTHER heating system type. Expected outcome: NA	not_applicable	rule19-1.json
HVAC_GEN-10	HVAC_GEN-10-a	The project has one building segment with one zone. Climate zone 5A, System 11, w/ Economizer, economizer in the proposed - PASS (Case 5)	pass	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-b	The project has one building segment with two zones. Climate zone 5A, System 5, w/o Economizer, economizer in the proposed - FAIL (Case 7)	fail	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-c	The project has one building segment with one zone. Climate zone 5A, System 3, primarily serving computer room, w/o Economizer, no economizer in the proposed - PASS (Case 1)	pass	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-d	The project has one building segment with one zone. Climate zone 5A, System 3, primarily serving computer room, w Economizer, no economizer in the proposed - FAIL (Case 3)	fail	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-e	The project has one building segment with one zone. Climate zone 5A, System 5, w/o Economizer, no economizer in the proposed - FAIL (Case 6)	fail	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-f	The project has one building segment with two zones. Climate zone 3A, System 5, w/o Economizer, no economizer in the proposed - NOT APPLICABLE (NA Climate Zone)	not_applicable	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-g	The project has one building segment with one zone. Climate zone 5A, System 9, w/o Economizer, no economizer in the proposed - NOT APPLICABLE (NA System Type)	not_applicable	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-h	The project has one building segment with two zones. Climate zone 5A, System 5, w/o Economizer, building has refrigerated cases, building type is retail, no economizer in the proposed - UNDETERMINED (Case 2)	undetermined	rule19-10.json
HVAC_GEN-10	HVAC_GEN-10-i	The project has one building segment with two zones. Climate zone 5A, System 5, w/ Economizer, building has refrigerated cases, building type is retail, no economizer in the proposed - UNDETERMINED (Case 4)	undetermined	rule19-10.json
HVAC_GEN-11	HVAC_GEN-11-a	The project has one building segment with one zone. Baseline building with computer room utilizes baseline System 11. The system includes an integrated fluid economizer. Expected outcome: UNDETERMINED	undetermined	rule19-11.json
HVAC_GEN-11	HVAC_GEN-11-b	The project has one building segment with one zone. Baseline building with computer room does not utilize baseline System 11. Therefore this building does not apply. Expected outcome: NOT APPLICABLE	not_applicable	rule19-11.json
HVAC_GEN-11	HVAC_GEN-11-c	The project has one building segment with one zone. Baseline building with computer room utilizes baseline System 11. The system does not include an integrated fluid economizer. Expected outcome: UNDETERMINED	undetermined	rule19-11.json
HVAC_GEN-12	HVAC_GEN-12-a	The project has one building segment with one zone. System 9 with TEMPERATURE based air economizer and 75F high limit shutoff temp. Expected outcome: PASS	pass	rule19-12.json
HVAC_GEN-12	HVAC_GEN-12-b	The project has one building segment with one zone. System 9 with TEMPERATURE based air economizer and 100F high limit shutoff temp. Expected outcome: FAIL	fail	rule19-12.json
HVAC_GEN-12	HVAC_GEN-12-c	The project has one building segment with one zone. System 9 with ENTHALPY based air economizer and 75F high limit shutoff temp. Expected outcome: FAIL	fail	rule19-12.json
HVAC_GEN-12	HVAC_GEN-12-d	The project has one building segment with one zone. System 9 without air economizer setup. Expected outcome: NOT APPLICABLE	not_applicable	rule19-12.json
HVAC_GEN-12	HVAC_GEN-12-e	The project has one building segment with one zone. System 9 with wrong climate zone setup. Expected outcome: NOT APPLICABLE	not_applicable	rule19-12.json
HVAC_GEN-13	HVAC_GEN-13-a	The project has one building segment with two zones. Baseline system type 7, supply-air-to-room temperature set-point difference of 20F, required ventilation or makeup air does not exceed. Airflow rate is correctly sized from temperature difference. Expected outcome: PASS	pass	rule19-13.json
HVAC_GEN-13	HVAC_GEN-13-b	The project has one building segment with one zone. Baseline system type 11, serving lab space, supply-air-to-room temperature set-point difference of 17F, required ventilation or makeup air does not exceed. Airflow rate is correctly sized from temperature difference. Expected outcome: PASS	pass	rule19-13.json
HVAC_GEN-13	HVAC_GEN-13-c	The project has one building segment with two zones. Baseline system type 7, supply-air-to-room temperature set-point difference of 20F, required ventilation exceeds sizing based on temperature difference. Airflow rate incorrectly based on temperature difference instead of required ventilation. Expected outcome: FAIL	fail	rule19-13.json
HVAC_GEN-13	HVAC_GEN-13-d	The project has one building segment with one zone. Baseline system type 11, serving lab space, supply-air-to-room temperature set-point difference of 20F, required ventilation or makeup air does not exceed sizing. Airflow rate is sized from the incorrect temperature difference. Expected outcome: FAIL	fail	rule19-13.json
HVAC_GEN-13	HVAC_GEN-13-e	The project has one building segment with two zones. Baseline system type 7, supply-air-to-room temperature set-point difference of 15F. The sum of zone terminal primary airflow from zones served by the system is identical to the corresponding sum of terminal primary flow in the proposed model. Expected outcome: UNDETERMINED	undetermined	rule19-13.json
HVAC_GEN-14	HVAC_GEN-14-a	The project has one building segment with one zone. System 11, no return or relief in the proposed, no return or relief cfm in the baseline - PASS	pass	rule19-14.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-14	HVAC_GEN-14-b	The project has one building segment with one zone. System 11, no return or relief in the proposed, return fan cfm modeled in the baseline - FAIL	fail	rule19-14.json
HVAC_GEN-14	HVAC_GEN-14-c	The project has one building segment with two zones. System 5, return fan in the proposed, baseline supply 1000 cfm, minimum outdoor air 200 cfm, return sized correctly at 900 cfm - PASS	pass	rule19-14.json
HVAC_GEN-14	HVAC_GEN-14-d	The project has one building segment with two zones. System 5, return fan in the proposed, baseline supply 1000 cfm, minimum outdoor air 50 cfm, return sized correctly at 950 cfm - PASS	pass	rule19-14.json
HVAC_GEN-14	HVAC_GEN-14-e	The project has one building segment with two zones. System 5, return fan in the proposed, baseline supply 1000 cfm, minimum outdoor air 200 cfm, return sized incorrectly at 800 cfm - FAIL	fail	rule19-14.json
HVAC_GEN-14	HVAC_GEN-14-f	The project has one building segment with two zones. System 5, multiple return fans modeled - UNDETERMINED	undetermined	rule19-14.json
HVAC_GEN-15	HVAC_GEN-15-a	The project has one building segment with one zone. Baseline system type 10, minimum ventilation does not exceed auto-sized airflow rates. Supply airflow rates are correctly based on the temperature difference between 105F and the design space-heating temperature set point. Expected outcome: PASS	pass	rule19-15.json
HVAC_GEN-15	HVAC_GEN-15-b	The project has one building segment with one zone. Baseline system type 10, minimum ventilation does not exceed auto-sized airflow rates. Supply airflow rates are incorrectly based on a supply-air-to-room temperature set-point difference of 20F. Expected outcome: FAIL	fail	rule19-15.json
HVAC_GEN-15	HVAC_GEN-15-c	The project has one building segment with one zone. Baseline system type 9, minimum ventilation exceeds the auto-sized airflow rates. Supply airflow rates are correctly based on the minimum ventilation airflow rates. Expected outcome: PASS	pass	rule19-15.json
HVAC_GEN-15	HVAC_GEN-15-d	The project has one building segment with one zone. Baseline system type 9, minimum ventilation exceeds the auto-sized airflow rates. Supply airflow rates are incorrectly based on the temperature difference between 105F and the design space-heating temperature set point. Expected outcome: FAIL	fail	rule19-15.json
HVAC_GEN-15	HVAC_GEN-15-e	The project has one building segment with one zone. Baseline system type 9 with more than one supply fan. Expected outcome: UNDETERMINED	undetermined	rule19-15.json
HVAC_GEN-16	HVAC_GEN-16-a	The project has one building segment with one zone. Proposed system type 9 includes a fan to provide non-mechanical cooling. The baseline system design has a separate fan to provide non-mechanical cooling sized and controlled the same as proposed case. This results in an undetermined per 19-16 Expected outcome: UNDETERMINED	undetermined	rule19-16.json
HVAC_GEN-16	HVAC_GEN-16-b	The project has one building segment with one zone. Proposed system type 10 includes a fan to provide non-mechanical cooling. The baseline system design has a separate fan to provide nonmechanical cooling sized and controlled the same as proposed case. This results in an undetermined per 19-16 Expected outcome: UNDETERMINED	undetermined	rule19-16.json
HVAC_GEN-16	HVAC_GEN-16-c	The project has one building segment with one zone. Proposed system type 10 doesn't include non-mechanical cooling. The baseline system design doesn't have a separate fan to provide nonmechanical cooling. This results in a not applicable per 19-16 Expected outcome: NOT_APPLICABLE	not_applicable	rule19-16.json
HVAC_GEN-17	HVAC_GEN-17-a	The project has one building segment with one zone. System 1 with `SIMPLE` specification method for supply/return/exhaust/relief fans and each of the 5 fans has 59 W design electric power for a total of 295 W with 1000 cfm design supply airflow. Expected outcome: PASS	pass	rule19-17.json
HVAC_GEN-17	HVAC_GEN-17-2	The project has one building segment with one zone. In baseline system 7, the system fan electrical power for supply, return, exhaust, and relief equals the bhp/fan motor efficiency. Baseline fan electric power = 13 HP (per Table G3.1.29), motor eff = 0.91 (per Table G3.9.1), CFM = 10,000. There is no MERV13 or ERV on this air loop. Expected outcome: PASS	pass	rule19-17.json
HVAC_GEN-17	HVAC_GEN-17-b	The project has one building segment with one zone. In baseline system 3, the system fan electrical power for supply, return, exhaust, and relief equals the bhp/fan motor efficiency. Baseline electric fan power = 0.94 HP (per Table G3.1.29), motor eff = 0.825 (per Table G3.9.1), CFM = 1,000. There is no MERV13 or ERV on this air loop. Expected outcome: FAIL	fail	rule19-17.json
HVAC_GEN-18	HVAC_GEN-18-a	The project has one building segment with two zones. In baseline system 3, the system fan electrical power for supply, return, exhaust, and relief equals the bhp/fan motor efficiency. Baseline electric fan power = 4.7 HP (per Table G3.1.29), motor eff = 0.875 (per Table G3.9.1), CFM = 5,000. There is no MERV13 or ERV on this air loop. Expected outcome: PASS	pass	rule19-18.json
HVAC_GEN-18	HVAC_GEN-18-b	The project has one building segment with one zone. In baseline system 7, the system fan electrical power for supply, return, exhaust, and relief is less than the minimum value of bhp/fan motor efficiency. Expected outcome: PASS	pass	rule19-18.json
HVAC_GEN-18	HVAC_GEN-18-c	The project has one building segment with one zone. In baseline system 3, the system fan electrical power for supply, return, exhaust, and relief is less than the minimum value of bhp/fan motor efficiency. Expected outcome: PASS	pass	rule19-18.json
HVAC_GEN-18	HVAC_GEN-18-d	The project has one building segment with two zones. A baseline system 7 has two return fans and therefore this rule requires manual check compliance with G3.1.2.9 Expected outcome: FAIL	fail	rule19-18.json
HVAC_GEN-18	HVAC_GEN-18-e	The project has one building segment with one zone. Baseline System 1 is is not applicable for Section 19 rule 18. Expected outcome: FAIL	fail	rule19-18.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-18	HVAC_GEN-18-f	The project has one building segment with two zones. A baseline system 7 has two return fans and therefore this rule requires manual check compliance with G3.1.2.9 Expected outcome: UNDETERMINED	undetermined	rule19-18.json
HVAC_GEN-18	HVAC_GEN-18-g	The project has one building segment with one zone. Baseline System 1 is is not applicable for Section 19 rule 18. Expected outcome: NOT_APPLICABLE	not_applicable	rule19-18.json
HVAC_GEN-19	HVAC_GEN-19-a	The project has one building segment with one zone. System 9 with 'SIMPLE' specification method for supply/return/exhaust/relief fans and each of 5 fans have 59 W design electric power for a total of 295 W with 1000 cfm design supply airflow. Expected outcome: PASS	pass	rule19-19.json
HVAC_GEN-19	HVAC_GEN-19-b	The project has one building segment with one zone. System 10 with 'SIMPLE' specification method for supply/return/exhaust/relief fans and each fans have 80 W design electric power with 800 cfm design supply airflow. Expected outcome: FAIL	fail	rule19-19.json
HVAC_GEN-19	HVAC_GEN-19-c	The project has one building segment with one zone. There is more than one supply fan in the baseline HVAC system Expected outcome: UNDETERMINED	undetermined	rule19-19.json
HVAC_GEN-19	HVAC_GEN-19-d	The project has one building segment with one zone. There is non-mechanical cooling associated with the zone served by the baseline HVAC system in the proposed model Expected outcome: UNDETERMINED	undetermined	rule19-19.json
HVAC_GEN-2	HVAC_GEN-2-a	The project has one building segment with two zones. System 7a with is sized using coincident load set to true. Expected outcome: PASS	pass	rule19-2.json
HVAC_GEN-2	HVAC_GEN-2-b	The project has one building segment with two zones. System 7a with is sized using coincident load set to false. Expected outcome: FAIL	fail	rule19-2.json
HVAC_GEN-20	HVAC_GEN-20-a	The project has one building segment with two zones. Project contains baseline system 7 with 'SIMPLE' specification method for supply/return/relief/exhaust fans. Proposed supply/return/relief/exhaust fans have 100W/50W/0W/50W design electric power respectively. Baseline fan power is proportionally distributed according to the proposed fan power. Expected outcome: PASS	pass	rule19-20.json
HVAC_GEN-20	HVAC_GEN-20-b	The project has one building segment with two zones. Project contains baseline system 5 with 'SIMPLE' specification method for supply/return/relief/exhaust fans. Proposed supply/return/relief/exhaust fans have 100W/50W/0W/50W design electric power respectively. Baseline fan power is not proportionally distributed according to the proposed fan power. Expected outcome: FAIL	fail	rule19-20.json
HVAC_GEN-21	HVAC_GEN-21-a	The project has one building segment with two zones. Case 1: Project is in climate zone 5A and contains baseline system 7 with 5000 cfm of supply air and 75% outdoor air. Energy recovery is correctly modeled for the system. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-b	The project has one building segment with one zone. Case 2: Project is in climate zone 5A and contains baseline system 7 with 5000 cfm of supply air and 75% outdoor air. System serves spaces that are not cooled and that are heated to less than 60F. Energy recovery is not modeled for the system. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-c	The project has one building segment with two zones. Case 3: Project is in climate zone 5A and contains baseline system 5 with 5000 cfm of supply air and 75% outdoor air. System serves zones likely to be exhausting toxic, flammable, or corrosive fumes or paint or dust that do not have energy recovery for the proposed system. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-d	The project has one building segment with one zone. Case 4: Project is in climate zone 3A and contains baseline system 10 with heating only, 5000 cfm of supply air, and 75% outdoor air. System serves zones that do not have energy recovery for the proposed system. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-e	The project has one building segment with two zones. Case 5:Project is in climate zone 5A and contains baseline system 5 with 5000 cfm of supply air and 75% outdoor air. The largest exhaust source is less than 75% of the design outdoor airflow. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-f	The project has one building segment with two zones. Case 6:Project is in climate zone 5A and contains baseline system 5 with 5000 cfm of supply air and 75% outdoor air. The proposed system has dehumidification that employs energy recovery in series with the cooling coil. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-g	The project has one building segment with one zone. Case 8:Project is in climate zone 5A and contains baseline system 3 with 5000 cfm of supply air and 75% outdoor air. System serves a kitchen type space indicating that exception 3 may be applicable. Expected outcome: UNDETERMINED	undetermined	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-h	The project has one building segment with two zones. Case 9:Project is in climate zone 5A and contains baseline system 5 with 5000 cfm of supply air and 75% outdoor air. The proposed HVAC system contains more than one exhaust fan, and the largest exhaust source could be less than 75% of the design outdoor airflow, but it cannot be determined if exception 6 is applicable. Expected outcome: UNDETERMINED	undetermined	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-i	The project has one building segment with two zones. Case 10:Project is in climate zone 5A and contains baseline system 7 with 5000 cfm of supply air and 69% outdoor air. Energy recovery is correctly not modeled for the system. Expected outcome: PASS	pass	rule19-21.json
HVAC_GEN-21	HVAC_GEN-21-j	The project has one building segment with two zones. Case 11:Project is in climate zone 5A and contains baseline system 7 with 5000 cfm of supply air and 75% outdoor air. Energy recovery is incorrectly not modeled for the system and not all space types have been defined so applicability of exceptions 2 and 3 cannot be determined. Expected outcome: FAIL	fail	rule19-21.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-21	HVAC_GEN-21-k	The project has one building segment with two zones. Case 12: Project is in climate zone 5A and contains baseline system 7 with 5000 cfm of supply air and 75% outdoor air. Energy recovery is incorrectly not modeled for the system. Expected outcome: FAIL	fail	rule19-21.json
HVAC_GEN-22	HVAC_GEN-22-a	The project has one building segment with one zone. Baseline system type 11 correctly modeled with "WHEN MINIMUM OUTSIDE AIR" energy recovery operations to allow bypass for economizer control. Expected outcome: PASS	pass	rule19-22.json
HVAC_GEN-22	HVAC_GEN-22-b	The project has one building segment with one zone. Baseline system type 11 incorrectly modeled with "WHEN FANS ON" energy recovery operations, preventing bypass for economizer control. Expected outcome: FAIL	fail	rule19-22.json
HVAC_GEN-23	HVAC_GEN-23-a	The project has one building segment with one zone and one space. An office space type is defined and the lighting, occupancy, and infiltration schedules line up with design days as expected. Expected outcome: PASS	pass	rule19-23.json
HVAC_GEN-23	HVAC_GEN-23-b	The project has one building segment with one zone and one space. A retail space type is defined and the lighting, occupancy, and infiltration schedules line up with design days as expected. Expected outcome: PASS	pass	rule19-23.json
HVAC_GEN-23	HVAC_GEN-23-c	The project has one building segment with one zone and one space. An office space type is defined and but the lighting schedule did not line up with cooling design days as expected. Expected outcome: FAIL	fail	rule19-23.json
HVAC_GEN-23	HVAC_GEN-23-d	The project has one building segment with one zone and one space. A retail space type is defined and but the lighting schedule did not line up with cooling design days as expected. Expected outcome: FAIL	fail	rule19-23.json
HVAC_GEN-23	HVAC_GEN-23-e	The project has one building segment with one zone and one space. An office space type is defined and but the occupancy schedule did not line up with cooling design days as expected. Expected outcome: FAIL	fail	rule19-23.json
HVAC_GEN-23	HVAC_GEN-23-f	The project has one building segment with one zone and one space. An office space type is defined and but the infiltration schedule did not line up with cooling design days as expected. Expected outcome: FAIL	fail	rule19-23.json
HVAC_GEN-24	HVAC_GEN-24-a	The project has one building segment with one zone. Project consists of a single-zone hot water/chilled water VAV HVAC system with a minimum outdoor airflow requirement of 100 cfm. The HVAC fan system correctly operates continuously during occupied hours. Expected outcome: PASS	pass	rule19-24.json
HVAC_GEN-24	HVAC_GEN-24-b	The project has one building segment with one zone. Project consists of a single-zone hot water/hot water VAV HVAC system with a minimum outdoor airflow requirement of 100 cfm. The HVAC fan system incorrectly cycles on and off during occupied hours to maintain temperature setpoints, but not outdoor airflow requirements. Expected outcome: FAIL	fail	rule19-24.json
HVAC_GEN-24	HVAC_GEN-24-c	The project has one building segment with one zone. Project consists of a packaged single-zone HVAC system with no minimum outdoor airflow requirement. The HVAC fan system correctly cycles on and off during occupied hours to maintain temperature setpoints. Expected outcome: PASS	pass	rule19-24.json
HVAC_GEN-24	HVAC_GEN-24-d	The project has one building segment with one zone. Project consists of a packaged single-zone HVAC system with no minimum outdoor airflow requirement. The HVAC fan system is set to remain off during occupied hours. Under the current rule definition, this is a failed outcome. Expected outcome: FAIL	fail	rule19-24.json
HVAC_GEN-25	HVAC_GEN-25-a	The project has one building segment with two zones. Project contains baseline system 11 with a minimum outdoor airflow requirement of 100 cfm. The HVAC fan system correctly operates continuously during occupied hours. Expected outcome: PASS	pass	rule19-25.json
HVAC_GEN-25	HVAC_GEN-25-b	The project has one building segment with two zones. Project contains baseline system 11 with a minimum outdoor airflow requirement of 100 cfm. The HVAC fan system incorrectly cycles on and off during occupied hours to maintain temperature setpoints, but not outdoor airflow requirements. Expected outcome: FAIL	fail	rule19-25.json
HVAC_GEN-25	HVAC_GEN-25-c	The project has one building segment with one zone. Project contains baseline system 7 with no minimum outdoor airflow requirement. The HVAC fan system correctly cycles on and off during occupied hours to maintain temperature setpoints. Expected outcome: PASS	pass	rule19-25.json
HVAC_GEN-25	HVAC_GEN-25-d	The project has one building segment with one zone. Project contains baseline system 3 with no minimum outdoor airflow requirement. The HVAC fan system is set to remain off during occupied hours. Under the current rule definition, this is a failed outcome. Expected outcome: FAIL	fail	rule19-25.json
HVAC_GEN-26	HVAC_GEN-26-a	The project has one building segment with two zones. Project consists of a hot water/chilled water VAV HVAC system serving a healthcare facility operating room with 100 CFM minimum outdoor air requirement. Fan system is correctly set to CONTINUOUS operation during unoccupied hours. Expected outcome: PASS	pass	rule19-26.json
HVAC_GEN-26	HVAC_GEN-26-b	The project has one building segment with one zone. Project consists of a single-zone hot water/chilled water VAV HVAC system serving an animal health facility room with 100 CFM minimum outdoor air requirement. Fan system is incorrectly set to KEEP OFF during unoccupied hours. Expected outcome: FAIL	fail	rule19-26.json
HVAC_GEN-27	HVAC_GEN-27-a	The project has one building segment with two zones. Project consists of a baseline System 7 serving a healthcare facility operating room with 100 CFM minimum outdoor air requirement. Fan system is correctly set to CONTINUOUS operation during unoccupied hours. Expected outcome: PASS	pass	rule19-27.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-27	HVAC_GEN-27-b	The project has one building segment with one zone. Project consists of a baseline System 11 serving an animal health facility room with 100 CFM minimum outdoor air requirement. Fan system is incorrectly set to KEEP OFF during unoccupied hours. Expected outcome: FAIL	fail	rule19-27.json
HVAC_GEN-28	HVAC_GEN-28-a	The project has one building segment with one zone. Project does not have spaces with health and safety mandated minimum ventilation requirements. HVAC fans correctly cycle on and off to maintain temperature setpoint during unoccupied hours. Expected outcome: PASS	pass	rule19-28.json
HVAC_GEN-28	HVAC_GEN-28-b	The project has one building segment with two zones. Project does not have spaces with health and safety mandated minimum ventilation requirements. HVAC fans incorrectly stay off during unoccupied hours. Expected outcome: FAIL	fail	rule19-28.json
HVAC_GEN-29	HVAC_GEN-29-a	The project has one building segment with one zone. Project does not have spaces with health and safety mandated minimum ventilation requirements. HVAC fans correctly cycle on and off to maintain temperature setpoint during unoccupied hours. Expected outcome: PASS	pass	rule19-29.json
HVAC_GEN-29	HVAC_GEN-29-b	Project does not have spaces with health and safety mandated minimum ventilation requirements. HVAC fans incorrectly stay off during unoccupied hours. Expected outcome: FAIL	fail	rule19-29.json
HVAC_GEN-3	HVAC_GEN-3-a	The project has one building segment with one zone. Building correctly has peak conditions on design days set to 99.6% for heating and 1% dry-bulb and wetbulb for cooling. Expected result is undetermined	undetermined	rule19-3.json
HVAC_GEN-3	HVAC_GEN-3-b	The project has one building segment with one zone. Building incorrectly has peak conditions on design days set to 99.0% for heating and 0.4% dry-bulb and wetbulb for cooling. Expected result is undetermined	undetermined	rule19-3.json
HVAC_GEN-30	HVAC_GEN-30-a	The project has one building segment with two zones. Baseline HVAC system is System 6 and requires a manual check to see that the terminal-unit fan and reheat coil are being energized to meet the heating set point during occupied hours Expected outcome: UNDETERMINED	undetermined	rule19-30.json
HVAC_GEN-30	HVAC_GEN-30-b	The project has one building segment with two zones. Baseline HVAC system is System 8 and requires a manual check to see that the terminal-unit fan and reheat coil are being energized to meet the heating set point during occupied hours Expected outcome: UNDETERMINED	undetermined	rule19-30.json
HVAC_GEN-30	HVAC_GEN-30-c	The project has one building segment with one zone. Baseline HVAC system does not have an air loop and this rule does not apply Expected outcome: NOT_APPLICABLE	not_applicable	rule19-30.json
HVAC_GEN-31	HVAC_GEN-31-a	The project has one building segment with one zone. Project contains a computer room served by a packaged terminal heat pump system. HVAC fans correctly operate continuously during unoccupied hours. Expected outcome: PASS	pass	rule19-31.json
HVAC_GEN-31	HVAC_GEN-31-b	The project has one building segment with one zone. Project contains a computer room served by a packaged terminal heat pump system. HVAC fans correctly operate continuously during unoccupied hours. Expected outcome: FAIL	fail	rule19-31.json
HVAC_GEN-32	HVAC_GEN-32-a	The project has one building segment with one zone. Project contains a computer room served by a baseline system 2. HVAC fans correctly operate continuously during unoccupied hours. Expected outcome: PASS	pass	rule19-32.json
HVAC_GEN-32	HVAC_GEN-32-b	The project has one building segment with one zone. Project contains a computer room served by a baseline system 2. HVAC fans incorrectly cycle on and off during unoccupied hours. Expected outcome: FAIL	fail	rule19-32.json
HVAC_GEN-33	HVAC_GEN-33-a	The project has one building segment with one zone. Project contains a NONE cooling system type served by a baseline system 1. The cooling system type is correctly modeled. Expected outcome: UNDETERMINED	undetermined	rule19-33.json
HVAC_GEN-33	HVAC_GEN-33-b	The project has one building segment with one zone. Project contains a NONE heating system type served by a baseline system 1. The heating system type is correctly modeled. Expected outcome: UNDETERMINED	undetermined	rule19-33.json
HVAC_GEN-33	HVAC_GEN-33-c	The project has one building segment with one zone. Project contains the DIRECT_EXPANSION cooling system type served by a baseline system 1. The heating and cooling system types are left as they are. Expected outcome: NOT_APPLICABLE	not_applicable	rule19-33.json
HVAC_GEN-34	HVAC_GEN-34-a	The project has one building segment with one zone. Project contains a NONE cooling system type and a 5000 ft2 floor area served by baseline system 1. Expected outcome: UNDETERMINED	undetermined	rule19-34.json
HVAC_GEN-34	HVAC_GEN-34-b	The project has one building segment with one zone. Project contains a 5000 ft2 floor area served by baseline system 1. Expected outcome: NOT_APPLICABLE	not_applicable	rule19-34.json
HVAC_GEN-35	HVAC_GEN-35-a	The project has one building segment with two zones. Project is in climate zone 5A and contains system 7 with 2 zones. All spaces served by the system are defined as lab. 5,000 cfm of aggregated minimum outdoor air flow for the baseline system, and 4,000 cfm in the proposed. Expected outcome: UNDETERMINED	undetermined	rule19-35.json
HVAC_GEN-35	HVAC_GEN-35-b	The project has one building segment with two zones. Project is in climate zone 4A and contains system 7 with 2 zones. The only defined space type for spaces served by the system is lab, but not all space types are defined. 5,000 cfm of aggregated minimum outdoor air flow for the baseline system, and 4,000 cfm in the proposed. Expected outcome: UNDETERMINED	undetermined	rule19-35.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-35	HVAC_GEN-35-c	The project has one building segment with two zones. Project is in climate zone 5A and contains system 5 with 2 zones. None of the spaces served by the system have space types defined. 5,000 cfm of aggregated minimum outdoor air flow for the baseline system, and 4,000 cfm in the proposed. Expected outcome: UNDETERMINED	undetermined	rule19-35.json
HVAC_GEN-35	HVAC_GEN-35-d	The project has one building segment with two zones. Project is in climate zone 4A and contains system 5 with 2 zones. There are spaces served by the system with non-lab space types defined. 5,000 cfm of aggregated minimum outdoor air flow for the baseline system, and 4,000 cfm in the proposed. Expected outcome: NOT_APPLICABLE	not_applicable	rule19-35.json
HVAC_GEN-36	HVAC_GEN-36-a	The project has one building segment with two zones. Baseline system 7 with air capacity > 5,000 CFM and a minimum supply air ratio greater than 70% has an ERV greater than 50% enthalpy recovery ratio Expected outcome: UNDETERMINED	undetermined	rule19-36.json
HVAC_GEN-36	HVAC_GEN-36-b	The project has one building segment with two zones. Baseline system 7 did not have ERV Expected outcome: NOT_APPLICABLE	not_applicable	rule19-36.json
HVAC_GEN-4	HVAC_GEN-4-a	The project has one building segment with two zones. Expected outcome: PASS	pass	rule19-4.json
HVAC_GEN-4	HVAC_GEN-4-b	The project has one building segment with two zones. Expected outcome: FAIL	fail	rule19-4.json
HVAC_GEN-4	HVAC_GEN-4-c	The project has one building segment with two zones. Expected outcome: NA	not_applicable	rule19-4.json
HVAC_GEN-4	HVAC_GEN-4-d	The project has one building segment with two zones. Expected outcome: undetermined	undetermined	rule19-4.json
HVAC_GEN-5	HVAC_GEN-5-a	The project has one building segment with one zone. System 3 with coincident_unmet_load_hours less than 300 hrs.Expected outcome: PASS	pass	rule19-5.json
HVAC_GEN-5	HVAC_GEN-5-b	The project has one building segment with one zone. System 3 with the sum of unmet_load_hours_heating and unmet_load_hours_cooling less than 300 hrs.Expected outcome: PASS	pass	rule19-5.json
HVAC_GEN-5	HVAC_GEN-5-c	The project has one building segment with one zone. System 3 with coincident_unmet_load_hours greater than 300 hrs.Expected outcome: FAIL	fail	rule19-5.json
HVAC_GEN-5	HVAC_GEN-5-d	The project has one building segment with one zone. System 3 with unmet_load_hours_cooling greater than 600 hrs. Expected outcome: FAIL	fail	rule19-5.json
HVAC_GEN-6	HVAC_GEN-6-a	The project has one building segment with one zone. System 3 with coincident_unmet_load_hours less than 300 hrs. Expected outcome: PASS	pass	rule19-6.json
HVAC_GEN-6	HVAC_GEN-6-b	The project has one building segment with one zone. System 3 with the sum of unmet_load_hours_heating and unmet_load_hours_cooling less than 300 hrs. Expected outcome: PASS	pass	rule19-6.json
HVAC_GEN-6	HVAC_GEN-6-c	The project has one building segment with one zone. System 3 with coincident_unmet_load_hours greater than 300 hrs. Expected outcome: FAIL	fail	rule19-6.json
HVAC_GEN-6	HVAC_GEN-6-d	The project has one building segment with one zone. System 3 with unmet_load_hours_cooling greater than 600 hrs. Expected outcome: FAIL	fail	rule19-6.json
HVAC_GEN-7	HVAC_GEN-7-a	The project has one building segment with two zones. System 7 serving two zones that do not have laboratory spaces where baseline and proposed outdoor air are identical. (Case 1) Expected outcome: PASS	pass	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-b	The project has one building segment with two zones. System 7 serving two zones, one has a laboratory space and one is not defined, baseline and proposed outdoor air are identical. Expected outcome: PASS (Case 2)	pass	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-c	The project has one building segment with two zones. System 6 serving two zones, all space types are undefined, baseline and proposed outdoor air are identical (Case 3)Expected outcome: PASS	pass	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-d	The project has one building segment with two zones. System 6 serving two zones that do not have laboratory spaces, one zone has Demand Control Ventilation controls, baseline outdoor air is greater than proposed outdoor air Expected outcome: FAIL (Case 4)	fail	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-e	The project has one building segment with two zones. System 6 serving two zones, one has a laboratory space and one is not defined, one zone has Demand Control Ventilation controls, baseline outdoor air is greater than proposed outdoor air Expected outcome: FAIL (Case 5)	fail	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-f	The project has one building segment with two zones. System 7 serving two zones, one has a laboratory space and one does not have a laboratory space, one zone has air distribution effectiveness greater than 1, baseline outdoor air is greater than proposed outdoor air. Expected outcome: undetermined (Case 6)	undetermined	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-g	The project has one building segment with two zones. System 7 serving two zones, one has a laboratory space and one is not defined, one zone has air distribution effectiveness greater than 1, baseline outdoor air is greater than proposed outdoor air. Expected outcome: undetermined (Case 7)	undetermined	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-h	The project has one building segment with two zones. System 7 serving two zones, baseline outdoor air is less than proposed outdoor air (Case 8). Expected outcome: undetermined	undetermined	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-i	The project has one building segment with two zones. System 7 serving two zones that do not have laboratory spaces, baseline outdoor air is greater than proposed outdoor air (Case 9). Expected outcome: FAIL	fail	rule19-7.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_GEN-7	HVAC_GEN-7-j	The project has one building segment with two zones. System 7 serving two zones where the baseline and proposed minimum outside air is equal, but the outside airflow multiplier schedule is not identical. Expected outcome: FAIL (Case 10)	fail	rule19-7.json
HVAC_GEN-7	HVAC_GEN-7-k	The project has one building segment with two zones. System 7 serving two zones, one zone has a laboratory space and one zone is not defined, baseline outdoor air is greater than proposed outdoor air. Expected outcome: FAIL (Case 11)	fail	rule19-7.json
HVAC_GEN-8	HVAC_GEN-8-a	The project has one building segment with one zone. System 3 with CO2_ZONE ventilation control type, 3500 minimum outdoor airflows, and 150 occupants in the 1000 ft2 zone. Expected outcome: PASS	pass	rule19-8.json
HVAC_GEN-8	HVAC_GEN-8-b	The project has one building segment with one zone. System 3 with NONE ventilation control type, 2800 minimum outdoor airflows, and 20 occupants in the 1000 ft2 zone. Expected outcome: FAIL	fail	rule19-8.json
HVAC_GEN-9	HVAC_GEN-9-a	The project has one building segment with one zone. System 9 without air economizer. Expected outcome: PASS	pass	rule19-9.json
HVAC_GEN-9	HVAC_GEN-9-b	The project has one building segment with one zone. System 9 with FIXED_FRACTION air economizer. Expected outcome: PASS	pass	rule19-9.json
HVAC_GEN-9	HVAC_GEN-9-c	The project has one building segment with one zone. System 9 with ENTHALPY air economizer.PASS (Case 5). Expected outcome: FAIL	fail	rule19-9.json
HVAC_HW-1	HVAC_HW-1-a	The project has one building segment with two zones. A baseline system 7 with purchased hot water in both the proposed and baseline model. This requires a manual check. EXPECTED: Undetermined	undetermined	rule21-1.json
HVAC_HW-1	HVAC_HW-1-b	The project has one building segment with two zones. A baseline system 7 with a conventional boiler and not purchased hot water in both the proposed and baseline model. This does not apply. EXPECTED: not_applicable	not_applicable	rule21-1.json
HVAC_HW-10	HVAC_HW-10-a	The project has one building segment with two zones and two spaces. Baseline ruleset project description has hot water plant with the hot water pump that serves a total of 100,000 ft2 floor area. The pump's speed control value is correctly set to FIXED_SPEED. Expected result: PASS	pass	rule21-10.json
HVAC_HW-10	HVAC_HW-10-b	The project has one building segment with two zones and two spaces. Baseline ruleset project description has hot water plant with the hot water pump that serves a total of 100,000 ft2 floor area. The pump's speed control value is incorrectly set to VARIABLE_SPEED. Expected result: FAIL	fail	rule21-10.json
HVAC_HW-10	HVAC_HW-10-c	The project has one building segment with one zone and one space. Baseline ruleset project description has hot water plant with the hot water pump that serves a total of 140,000 ft2 floor area. The pump's speed control value is correctly set to VARIABLE_SPEED. Expected result: PASS	pass	rule21-10.json
HVAC_HW-10	HVAC_HW-10-d	The project has one building segment with one zone and one space. Baseline ruleset project description has hot water plant with the hot water pump that serves a total of 140,000 ft2 floor area. The pump's speed control value is incorrectly set to FIXED_SPEED. Expected result: FAIL	fail	rule21-10.json
HVAC_HW-10	HVAC_HW-10-e	The project has one building segment with two zones and one space. Baseline ruleset project description system type 8 Expected result: Not Applicable	not_applicable	rule21-10.json
HVAC_HW-11	HVAC_HW-11-a	The project has one building segment with two zones. Baseline ruleset project description has system 7 with child loop value correctly set to null. Expected result: PASS	pass	rule21-11.json
HVAC_HW-11	HVAC_HW-11-b	The project has one building segment with two zones. Baseline ruleset project description has system 7 with child loop incorrectly referencing to FluidLoop 2. Expected result: FAIL	fail	rule21-11.json
HVAC_HW-11	HVAC_HW-11-c	The project has one building segment with one zone. Baseline ruleset project description has system 12a with child loop value correctly set to null. Expected result: PASS	pass	rule21-11.json
HVAC_HW-11	HVAC_HW-11-d	The project has one building segment with one zone. Baseline ruleset project description has system 12a with child loop incorrectly referencing to FluidLoop 2. Expected result: FAIL	fail	rule21-11.json
HVAC_HW-11	HVAC_HW-11-e	The project has one building segment with one zone. Baseline ruleset project description has system 10. Expected result: Not Applicable	not_applicable	rule21-11.json
HVAC_HW-12	HVAC_HW-12-a	The project has one building segment with two zones. Baseline ruleset project description has system 7 with flow control and operation correctly. Expected result: PASS	pass	rule21-12.json
HVAC_HW-12	HVAC_HW-12-b	The project has one building segment with two zones. Baseline ruleset project description has system 7 with flow control specified correctly, and operation incorrectly. Expected result: FAIL	fail	rule21-12.json
HVAC_HW-12	HVAC_HW-12-c	The project has one building segment with two zones. Baseline ruleset project description has system 7 with flow control specified incorrectly, and operation correctly. Expected result: FAIL	fail	rule21-12.json
HVAC_HW-12	HVAC_HW-12-d	The project has one building segment with one zone. Baseline ruleset project description has system 1b with flow control and operation correctly. Expected result: PASS	pass	rule21-12.json
HVAC_HW-12	HVAC_HW-12-e	The project has one building segment with one zone. Baseline ruleset project description has system 1b with flow control specified correctly, and operation incorrectly. Expected result: FAIL	fail	rule21-12.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_HW-12	HVAC_HW-12-f	The project has one building segment with one zone. Baseline ruleset project description has system 1b with flow control specified incorrectly, and operation correctly. Expected result: FAIL	fail	rule21-12.json
HVAC_HW-12	HVAC_HW-12-g	The project has one building segment with one zone. Baseline ruleset project description has system 9. Expected result: Not Applicable	not_applicable	rule21-12.json
HVAC_HW-13	HVAC_HW-13-a	The project has one building segment with two zones. Baseline ruleset project description has system 7 with heating design and control's minimum flow fraction correctly set to 0.25. Expected result: PASS	pass	rule21-13.json
HVAC_HW-13	HVAC_HW-13-b	The project has one building segment with two zones. Baseline ruleset project description has system 7 with heating design and control's minimum flow fraction incorrectly set to 0.30. Expected result: FAIL	fail	rule21-13.json
HVAC_HW-13	HVAC_HW-13-c	The project has one building segment with one zone. Baseline ruleset project description has system 3b with heating design and control's minimum flow fraction correctly set to 0.25. Expected result: PASS	pass	rule21-13.json
HVAC_HW-13	HVAC_HW-13-d	The project has one building segment with one zone. Baseline ruleset project description has system 3b with heating design and control's minimum flow fraction incorrectly set to 0.30. Expected result: FAIL	fail	rule21-13.json
HVAC_HW-13	HVAC_HW-13-e	The project has one building segment with one zone. Baseline ruleset project description has system 11.1a. Expected result: Not Applicable	not_applicable	rule21-13.json
HVAC_HW-16	HVAC_HW-16-a	The project has one building segment with two zones. Baseline ruleset project description has system 7 correctly modeled with a single heating loop. Expected result: PASS	pass	rule21-16.json
HVAC_HW-16	HVAC_HW-16-b	The project has one building segment with two zones. Baseline ruleset project description has system 7 incorrectly modeled with more than one heating loop. Expected result: FAIL	fail	rule21-16.json
HVAC_HW-16	HVAC_HW-16-c	The project has one building segment with two zones. Baseline ruleset project description has system 5b correctly modeled with a single heating loop. Expected result: PASS	pass	rule21-16.json
HVAC_HW-16	HVAC_HW-16-d	The project has one building segment with two zones. Baseline ruleset project description has system 5b incorrectly modeled with more than one heating loop. Expected result: FAIL	fail	rule21-16.json
HVAC_HW-16	HVAC_HW-16-e	The project has one building segment with one zone. Baseline ruleset project description has system 11.1. Expected result: Not Applicable	not_applicable	rule21-16.json
HVAC_HW-17	HVAC_HW-17-a	The project has one building segment with two zones. Baseline ruleset project description has system 7 with < 300 kBtu/hr, has AFUE equal to 80% as per Tables G3.5.6. Expected result: PASS	pass	rule21-17.json
HVAC_HW-17	HVAC_HW-17-b	The project has one building segment with two zones. Baseline ruleset project description has system 7 with < 300 kBtu/hr, has AFUE equal to 80% as per Tables G3.5.6, BUT efficiency_metric is incorrect. Expected result: FAIL	fail	rule21-17.json
HVAC_HW-17	HVAC_HW-17-c	The project has one building segment with two zones. Baseline ruleset project description has system 7 with < 300 kBtu/hr, AFUE does not equal 80% as per Tables G3.5.6. Expected result: FAIL	fail	rule21-17.json
HVAC_HW-17	HVAC_HW-17-d	The project has one building segment with two zones. Baseline ruleset project description has system 7 with greater than 300 kBtu/hr but less than 2,500 kBtu/hr, has thermal efficiency equal to 75% as per Tables G3.5.6. Expected result: PASS	pass	rule21-17.json
HVAC_HW-17	HVAC_HW-17-e	The project has one building segment with two zones. Baseline ruleset project description has system 7 with greater than 300 kBtu/hr but less than 2,500 kBtu/hr, has thermal efficiency equal to 75% as per Tables G3.5.6, BUT efficiency_metric incorrect. Expected result: FAIL	fail	rule21-17.json
HVAC_HW-17	HVAC_HW-17-f	The project has one building segment with two zones. Baseline ruleset project description has system 7 with greater than 300 kBtu/hr but less than 2,500 kBtu/hr, thermal efficiency does not equal 75% as per Tables G3.5.6. Expected result: FAIL	fail	rule21-17.json
HVAC_HW-17	HVAC_HW-17-g	The project has one building segment with one zone. Baseline ruleset project description has system 12a with greater than 2,500 kBtu/hr, has combustion efficiency equal to 80% as per Tables G3.5.6. Expected result: PASS	pass	rule21-17.json
HVAC_HW-17	HVAC_HW-17-h	The project has one building segment with one zone. Baseline ruleset project description has system 12a with greater than 2,500 kBtu/hr, has combustion efficiency equal to 80% as per Tables G3.5.6, BUT efficiency_metric incorrect. Expected result: FAIL	fail	rule21-17.json
HVAC_HW-17	HVAC_HW-17-i	The project has one building segment with one zone. Baseline ruleset project description has system 12b. Expected result: Not Applicable	not_applicable	rule21-17.json
HVAC_HW-18	HVAC_HW-18-a	The project has one building segment with two zones. System 7 is correctly modeled with a natural gas boiler. Expected result: PASS	pass	rule21-18.json
HVAC_HW-18	HVAC_HW-18-b	The project has one building segment with two zones. System 7 is incorrectly modeled an electric boiler. Expected result: FAIL	fail	rule21-18.json
HVAC_HW-18	HVAC_HW-18-c	The project has one building segment with two zones. A purchased hot water system does not have an applicable fuel type. Expected result: Not Applicable	not_applicable	rule21-18.json
HVAC_HW-18	HVAC_HW-18-d	The project has one building segment with two zones. System 7 is modeled a propane boiler. Expected result: Undetermined	undetermined	rule21-18.json
HVAC_HW-18	HVAC_HW-18-e	The project has one building segment with one zone. System 1 is correctly modeled with a natural gas boiler. Expected result: PASS	pass	rule21-18.json
HVAC_HW-18	HVAC_HW-18-f	The project has one building segment with one zone. System 1 is incorrectly modeled an electric boiler. Expected result: FAIL	fail	rule21-18.json
HVAC_HW-18	HVAC_HW-18-g	The project has one building segment with one zone. System 1c Expected Result: Not Applicable	not_applicable	rule21-18.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_HW-2	HVAC_HW-2-a	The project has one building segment with two zones. A baseline system 7 with purchased hot water in both the proposed and baseline model. This requires a manual check. EXPECTED: Undetermined	undetermined	rule21-2.json
HVAC_HW-2	HVAC_HW-2-b	The project has one building segment with two zones. A baseline system 7 with a conventional boiler and not purchased hot water in both the proposed and baseline model. This does not apply. EXPECTED: not_applicable	not_applicable	rule21-2.json
HVAC_HW-3	HVAC_HW-3-a	The project has one building segment with two zones. Space conditioning is provided by system type 7 with boiler. The baseline building's hot water system's sizing is based on coincident loads. Expected result: PASS	pass	rule21-3.json
HVAC_HW-3	HVAC_HW-3-b	The project has one building segment with two zones. Space conditioning is provided by system type 7 with boiler. The baseline building's hot water system's sizing is NOT based on coincident loads. Expected result: FAIL	fail	rule21-3.json
HVAC_HW-3	HVAC_HW-3-c	The project has one building segment with two zones. Space conditioning is provided by system type 5 with boiler. The baseline building's hot water system's sizing is based on coincident loads. Expected result: PASS	pass	rule21-3.json
HVAC_HW-3	HVAC_HW-3-d	The project has one building segment with two zones. Space conditioning is provided by system type 5 with boiler. The baseline building's hot water system's sizing is NOT based on coincident loads. Expected result: FAIL	fail	rule21-3.json
HVAC_HW-3	HVAC_HW-3-e	The project has one building segment with one zone. Space conditioning is provided by system type 2. Expected result: UNDETERMINED	not_applicable	rule21-3.json
HVAC_HW-4	HVAC_HW-4-a	The project has one building segment with two zones. Space conditioning is provided by system type 7 with boiler and is correctly modeled with a natural draft boiler. Expected result: PASS	pass	rule21-4.json
HVAC_HW-4	HVAC_HW-4-b	The project has one building segment with two zones. Space conditioning is provided by system type 7 with boiler and is incorrectly modeled with a forced draft boiler. Expected result: FAIL	fail	rule21-4.json
HVAC_HW-4	HVAC_HW-4-c	The project has one building segment with one zone. Space conditioning is provided by system type 11.2 with boiler and is correctly modeled with a natural draft boiler. Expected result: PASS	pass	rule21-4.json
HVAC_HW-4	HVAC_HW-4-d	The project has one building segment with one zone. Space conditioning is provided by system type 11.2 with boiler and is incorrectly modeled with a forced draft boiler. Expected result: FAIL	fail	rule21-4.json
HVAC_HW-4	HVAC_HW-4-e	The project has one building segment with one zone. Space conditioning is provided by system type 3 with no hot water loops. Expected result: NOT APPLICABLE	not_applicable	rule21-4.json
HVAC_HW-5	HVAC_HW-5-a	The project has one building segment with two zones and two spaces. Building is 12,000 ft2, has baseline system type 7 and is correctly modeled with a hot water Loop with a single boiler. Expected result: PASS	pass	rule21-5.json
HVAC_HW-5	HVAC_HW-5-b	The project has one building segment with two zones and two spaces. Building is 12,000 ft2, has baseline system type 7 and is incorrectly modeled with a hot water Loop with two boilers. Expected result: FAIL	fail	rule21-5.json
HVAC_HW-5	HVAC_HW-5-c	The project has one building segment with one zone and one space. Building is 24,000 ft2, has baseline system type 12 and is correctly modeled with a hot water Loop with two equally sized boiler(s). Expected result: PASS	pass	rule21-5.json
HVAC_HW-5	HVAC_HW-5-d	The project has one building segment with one zone and one space. Building is 24,000 ft2, has baseline system type 12 and is incorrectly modeled with a hot water Loop with two unequally sized boiler(s). Expected result: FAIL	fail	rule21-5.json
HVAC_HW-5	HVAC_HW-5-e	The project has one building segment with one zone and one space. Building is 24,000 ft2, has baseline system type 12 and is incorrectly modeled with a hot water Loop with one boiler. Expected result: FAIL	fail	rule21-5.json
HVAC_HW-5	HVAC_HW-5-f	The project has one building segment with one zone and one space. Building is 24,000 ft2, has baseline system type 4. Expected result: Not Applicable	not_applicable	rule21-5.json
HVAC_HW-6	HVAC_HW-6-a	The project has one building segment with two zones and two spaces. Baseline ruleset project description has utilizes system 7 with two boilers staged based on load. Boiler 1 is staged before Boiler 2. Expected result: PASS	pass	rule21-6.json
HVAC_HW-6	HVAC_HW-6-b	The project has one building segment with two zones and two spaces. Baseline ruleset project description has utilizes system 7 with two boilers staged based on load. Boiler 2 is staged before Boiler 1. Expected result: PASS	pass	rule21-6.json
HVAC_HW-6	HVAC_HW-6-c	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 7 with two boilers is not staged based on load. Expected result: FAIL	fail	rule21-6.json
HVAC_HW-6	HVAC_HW-6-d	The project has one building segment with one zone and two spaces. Baseline ruleset project description has utilizes system 1 with two boilers staged based on load. Boiler 1 is staged before Boiler 2. Expected result: PASS	pass	rule21-6.json
HVAC_HW-6	HVAC_HW-6-e	The project has one building segment with one zone and two spaces. Baseline ruleset project description has utilizes system 1 with two boilers staged based on load. Boiler 2 is staged before Boiler 1. Expected result: PASS	pass	rule21-6.json
HVAC_HW-6	HVAC_HW-6-f	The project has one building segment with one zone. Baseline ruleset project description has utilizes system 1 with two boilers is not staged based on load. Expected result: FAIL	fail	rule21-6.json
HVAC_HW-6	HVAC_HW-6-g	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 6. Expected result: NOT APPLICABLE	not_applicable	rule21-6.json
HVAC_HW-7	HVAC_HW-7-a	The project has one building segment with two zones. Baseline ruleset project description utilizes system 7 with supply and return temperatures correctly set to 180 F and 130 F respectively. Expected result: PASS	pass	rule21-7.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_HW-7	HVAC_HW-7-b	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 7 with supply and return temperatures incorrectly set to 200 F and correctly set to 130 F respectively. Expected result: FAIL	fail	rule21-7.json
HVAC_HW-7	HVAC_HW-7-c	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 7 with supply and return temperatures correctly set to 180 F and inccorectly to 150 F respectively. Expected result: FAIL	fail	rule21-7.json
HVAC_HW-7	HVAC_HW-7-d	The project has one building segment with two zones. Baseline ruleset project description utilizes system 5 with supply and return temperatures correctly set to 180 F and 130 F respectively. Expected result: PASS	pass	rule21-7.json
HVAC_HW-7	HVAC_HW-7-e	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 5 with supply and return temperatures incorrectly set to 200 F and correctly set to 130 F respectively. Expected result: FAIL	fail	rule21-7.json
HVAC_HW-7	HVAC_HW-7-f	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 5 with supply and return temperatures correctly set to 180 F and inccorectly to 150 F respectively. Expected result: FAIL	fail	rule21-7.json
HVAC_HW-7	HVAC_HW-7-g	The project has one building segment with two zones. Baseline ruleset project description has utilizes system 5b. Expected result: Not Applicable	not_applicable	rule21-7.json
HVAC_HW-8	HVAC_HW-8-a	The project has one building segment with two zones. Baseline System 7's boiler has outdoor air temperature based supply temperature reset. Hot water temperatures are at 150 F when temperature are high, and 180 F when they are low. High outdoor air temperature set to 50F and low outdoor air temperature set to 20 F. Expected Result: Pass	pass	rule21-8.json
HVAC_HW-8	HVAC_HW-8-b	The project has one building segment with two zones. Baseline System 5's boiler has outdoor air temperature based supply temperature reset. Hot water temperatures are at 150 F when temperature are high, and 180 F when they are low. High outdoor air temperature set to 50F and low outdoor air temperature set to 20 F. Expected Result: Pass	pass	rule21-8.json
HVAC_HW-8	HVAC_HW-8-c	The project has one building segment with two zones. Baseline System 7's boiler has outdoor air temperature based supply temperature reset. Hot water temperatures are at 160 F when temperature are high, and 190 F when they are low. High outdoor air temperature set to 50F and low outdoor air temperature set to 20 F. Expected Result: Fail	fail	rule21-8.json
HVAC_HW-8	HVAC_HW-8-d	The project has one building segment with two zones. Baseline System 5's boiler has outdoor air temperature based supply temperature reset. Hot water temperatures are at 160 F when temperature are high, and 190 F when they are low. High outdoor air temperature set to 50F and low outdoor air temperature set to 20 F. Expected Result: Fail	fail	rule21-8.json
HVAC_HW-9	HVAC_HW-9-a	The project has one building segment with two zones. Baseline ruleset project description utilizes system 7 with total pump power per flow rate correctly set to 19 W/gpm. Expected result: PASS	pass	rule21-9.json
HVAC_HW-9	HVAC_HW-9-b	The project has one building segment with two zones. Baseline ruleset project description utilizes system 7 with total pump power per flow rate incorrectly set to 21 W/gpm. Expected result: FAIL	fail	rule21-9.json
HVAC_HW-9	HVAC_HW-9-c	The project has one building segment with one zone. Baseline ruleset project description utilizes system 1a with total pump power per flow rate correctly set to 19 W/gpm. Expected result: PASS	pass	rule21-9.json
HVAC_HW-9	HVAC_HW-9-d	The project has one building segment with one zone. Baseline ruleset project description utilizes system 1a with total pump power per flow rate incorrectly set to 21 W/gpm. Expected result: FAIL	fail	rule21-9.json
HVAC_HW-9	HVAC_HW-9-e	The project has one building segment with one zone. Baseline ruleset project description utilizes system 1b. Expected result: Not Applicable	not_applicable	rule21-9.json
HVAC_CHW-1	HVAC_CHW-1-a	The project has one building segment with two zones. HVAC system type 7. It is correctly modeled with a chilled water Loop design supply temperature. Expected result: PASS	pass	rule22-1.json
HVAC_CHW-1	HVAC_CHW-1-b	The project has one building segment with two zones. HVAC system type 7. It is correctly modeled with a chilled water Loop design supply temperature. Expected result: FAIL	fail	rule22-1.json
HVAC_CHW-1	HVAC_CHW-1-c	The project has one building segment with two zones. HVAC system type 7b. It is correctly modeled with a chilled water Loop design supply temperature. Expected result: PASS	pass	rule22-1.json
HVAC_CHW-1	HVAC_CHW-1-d	The project has one building segment with two zones. HVAC system type 7b. It is correctly modeled with a chilled water Loop design supply temperature. Expected result: FAIL	fail	rule22-1.json
HVAC_CHW-1	HVAC_CHW-1-e	The project has one building segment with one zone. HVAC system type 1 and no chilled water loop. Expected result: Not Applicable	not_applicable	rule22-1.json
HVAC_CHW-10	HVAC_CHW-10-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the pump speed_control FIXED_SPEED for chilled water loop cooling capacity less than 300 tons. Expected result: PASS	pass	rule22-10.json
HVAC_CHW-10	HVAC_CHW-10-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the pump speed_control VARIABLE_SPEED for chilled water loop cooling capacity less than 300 tons. Expected result: FAIL	fail	rule22-10.json
HVAC_CHW-10	HVAC_CHW-10-c	The project has one building segment with one zone. HVAC is system type 12 and is correctly modeled with the pump speed_control VARIABLE_SPEED for chilled water loop cooling capacity greater than 300 tons. Expected result: PASS	pass	rule22-10.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-10	HVAC_CHW-10-d	The project has one building segment with one zone. HVAC is system type 12 and is incorrectly modeled with the pump speed_control FIXED_SPEED for chilled water loop cooling capacity greater than 300 tons. Expected result: FAIL	fail	rule22-10.json
HVAC_CHW-10	HVAC_CHW-10-e	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled without a secondary loop. Expected result: Not Applicable	not_applicable	rule22-10.json
HVAC_CHW-10	HVAC_CHW-10-f	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the pump speed_control and chilled water loop cooling capacity greater than 300 tons. Expected result: Not Applicable	not_applicable	rule22-10.json
HVAC_CHW-11	HVAC_CHW-11-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the secondary chilled water pump power per flow rate of 13 W/GPM. Expected result: PASS	pass	rule22-11.json
HVAC_CHW-11	HVAC_CHW-11-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the secondary chilled water pump power per flow rate of 15 W/GPM. Expected result: FAIL	fail	rule22-11.json
HVAC_CHW-11	HVAC_CHW-11-c	The project has one building segment with one zone. HVAC is system type 13 and is correctly modeled with the secondary chilled water pump power per flow rate of 13 W/GPM. Expected result: PASS	pass	rule22-11.json
HVAC_CHW-11	HVAC_CHW-11-d	The project has one building segment with one zone. HVAC is system type 13 and is incorrectly modeled with the secondary chilled water pump power per flow rate of 15 W/GPM. Expected result: FAIL	fail	rule22-11.json
HVAC_CHW-11	HVAC_CHW-11-e	The project has one building segment with one zone. HVAC is system type 10 with no chilled water system. Expected result: Not Applicable	not_applicable	rule22-11.json
HVAC_CHW-12	HVAC_CHW-12-a	The project has one building segment with two zones. HVAC system type 7 and correctly has exactly 1 heat rejection and 1 heat rejection loop. Expected result: PASS	pass	rule22-12.json
HVAC_CHW-12	HVAC_CHW-12-b	The project has one building segment with two zones. HVAC system type 7 and incorrectly has 1 heat rejection and 2 heat rejection loops. Expected result: FAIL	fail	rule22-12.json
HVAC_CHW-12	HVAC_CHW-12-c	The project has one building segment with two zones. HVAC system type 7 and incorrectly has 2 heat rejections and 1 heat rejection loop. Expected result: FAIL	fail	rule22-12.json
HVAC_CHW-12	HVAC_CHW-12-d	The project has one building segment with two zones. HVAC system type 7 and incorrectly has 2 heat rejections and 2 heat rejection loops. Expected result: FAIL	fail	rule22-12.json
HVAC_CHW-12	HVAC_CHW-12-e	The project has one building segment with two zones. System 7 but does not have a heat rejection loop. Expected result: Not Applicable	not_applicable	rule22-12.json
HVAC_CHW-13	HVAC_CHW-13-a	The project has one building segment with two zones. System 7 cooling tower utilizes an axial fan type. Expected result: PASS	pass	rule22-13.json
HVAC_CHW-13	HVAC_CHW-13-b	The project has one building segment with two zones. System 7 cooling tower does not utilize an axial fan type. Expected result: FAIL	fail	rule22-13.json
HVAC_CHW-13	HVAC_CHW-13-c	The project has one building segment with two zones. System 7 cooling tower is not connected to a valid condensing loop. Expected result: Not Applicable	not_applicable	rule22-13.json
HVAC_CHW-14	HVAC_CHW-14-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the design temperature rise range of 10 F. Expected result: PASS	pass	rule22-14.json
HVAC_CHW-14	HVAC_CHW-14-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the design temperature rise range of 15 F. Expected result: FAIL	fail	rule22-14.json
HVAC_CHW-14	HVAC_CHW-14-c	The project has one building segment with two zones. HVAC is system type 7b and is correctly modeled with the design temperature rise range of 10 F. Expected result: PASS	pass	rule22-14.json
HVAC_CHW-14	HVAC_CHW-14-d	The project has one building segment with two zones. HVAC is system type 7b and is incorrectly modeled with the design temperature rise range of 15 F. Expected result: FAIL	fail	rule22-14.json
HVAC_CHW-14	HVAC_CHW-14-e	The project has one building segment with one zone. HVAC is system type 11a and does not have a chiller. Expected result: Not Applicable	not_applicable	rule22-14.json
HVAC_CHW-15	HVAC_CHW-15-a	The project has one building segment with two zones. Approach temperature on System 7's heat rejection component correctly follows 25.72- (0.24 * design wet bulb temperature) delta Fahrenheit for design wetbulb temperatures between 55 F and 90 F. Expected result: PASS	pass	rule22-15.json
HVAC_CHW-15	HVAC_CHW-15-b	The project has one building segment with two zones. Approach temperature on System 7's heat rejection component did not correctly follow 25.72- (0.24 * design wet bulb temperature) delta Fahrenheit for design wetbulb temperatures between 55 F and 90 F. Expected result: FAIL	fail	rule22-15.json
HVAC_CHW-15	HVAC_CHW-15-c	The project has one building segment with two zones. Approach temperature on System 7's heat rejection component does not fall between 55 F and 90 F. Not applicable.	not_applicable	rule22-15.json
HVAC_CHW-16	HVAC_CHW-16-a	The project has one building segment with two zones. HVAC is system type 7 and the HeatRejection is correctly modeled with the wet-bulb and approach temperatures. Expected result: PASS	pass	rule22-16.json
HVAC_CHW-16	HVAC_CHW-16-b	The project has one building segment with two zones. HVAC is system type 7 and the HeatRejection is modeled with the incorrect wet-bulb and approach temperatures. Expected result: FAIL	fail	rule22-16.json
HVAC_CHW-16	HVAC_CHW-16-c	The project has one building segment with two zones. HVAC is system type 7 and the HeatRejection design_wetbulb_temperature < 55. Expected result: Not Applicable	not_applicable	rule22-16.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-16	HVAC_CHW-16-d	The project has one building segment with one zone. HVAC is system type 11.2 and the HeatRejection is correctly modeled with the wet-bulb and approach temperatures. Expected result: PASS	pass	rule22-16.json
HVAC_CHW-16	HVAC_CHW-16-e	The project has one building segment with one zone. HVAC is system type 11.2 and the HeatRejection is modeled with the incorrect wet-bulb and approach temperatures. Expected result: FAIL	fail	rule22-16.json
HVAC_CHW-16	HVAC_CHW-16-f	The project has one building segment with one zone. HVAC is system type 11.2 and the HeatRejection design_wetbulb_temperature > 95. Expected result: Not Applicable	not_applicable	rule22-16.json
HVAC_CHW-17	HVAC_CHW-17-a	The project has one building segment with two zones. The project includes a cooling tower. We calculated the cooling tower efficiency to be 40 gpm/hp, which is greater than the required efficiency of 38.2 gpm / hp, resulting in a more stringent baseline. Expected result: Undetermined	undetermined	rule22-17.json
HVAC_CHW-17	HVAC_CHW-17-b	The project has one building segment with two zones. The project includes a cooling tower. We calculated the cooling tower efficiency to be 38.2 gpm/hp, which is exactly equal to the required efficiency of 38.2 gpm / hp. Expected result: Undetermined	undetermined	rule22-17.json
HVAC_CHW-17	HVAC_CHW-17-c	The project has one building segment with two zones. The project includes a cooling tower. We calculated the cooling tower efficiency to be 20 gpm/hp, which is less than the required efficiency of 38.2 gpm / hp. Expected result: Undetermined	undetermined	rule22-17.json
HVAC_CHW-17	HVAC_CHW-17-d	The project has one building segment with one zone. Building does not include a cooling tower and is therefore not applicable. Expected result: Not Applicable	not_applicable	rule22-17.json
HVAC_CHW-18	HVAC_CHW-18-a	The project has one building segment with two zones. System 7 cooling tower correctly utilizes variable speed fan control. Expected result: Pass	pass	rule22-18.json
HVAC_CHW-18	HVAC_CHW-18-b	The project has one building segment with two zones. System 7 cooling tower incorrectly utilizes constant speed fan control. Expected result: FAIL	fail	rule22-18.json
HVAC_CHW-18	HVAC_CHW-18-c	The project has one building segment with two zones. System 7 but does not have a heat rejection loop. Expected result: Not Applicable	not_applicable	rule22-18.json
HVAC_CHW-19	HVAC_CHW-19-a	The project has one building segment with two zones. HVAC is system type 7 and HeatRejection is correctly modeled with the temperature reset type CONSTANT. Expected result: PASS	pass	rule22-19.json
HVAC_CHW-19	HVAC_CHW-19-b	The project has one building segment with two zones. HVAC is system type 7 and HeatRejection is incorrectly modeled with the temperature reset type OUTSIDE_AIR_RESET. Expected result: FAIL	fail	rule22-19.json
HVAC_CHW-19	HVAC_CHW-19-c	The project has one building segment with one zone. HVAC is system type 12b and HeatRejection is correctly modeled with the temperature reset type CONSTANT. Expected result: PASS	pass	rule22-19.json
HVAC_CHW-19	HVAC_CHW-19-d	The project has one building segment with one zone. HVAC is system type 12b and HeatRejection is incorrectly modeled with the temperature reset type OUTSIDE_AIR_RESET. Expected result: FAIL	fail	rule22-19.json
HVAC_CHW-19	HVAC_CHW-19-e	The project has one building segment with one zone. HVAC is system type 11.2a. Expected result: NOT APPLICABLE	not_applicable	rule22-19.json
HVAC_CHW-2	HVAC_CHW-2-a	The project has one building segment with two zones. HVAC system is system type 7 and is correctly modeled with a chilled water Loop design return temperature. Expected result: PASS	pass	rule22-2.json
HVAC_CHW-2	HVAC_CHW-2-b	The project has one building segment with two zones. HVAC system is system type 7 and is incorrectly modeled with a chilled water Loop design return temperature. Expected result: FAIL	fail	rule22-2.json
HVAC_CHW-2	HVAC_CHW-2-c	The project has one building segment with two zones. HVAC system is system type 8 and is correctly modeled with a chilled water Loop design return temperature. Expected result: PASS	pass	rule22-2.json
HVAC_CHW-2	HVAC_CHW-2-d	The project has one building segment with two zones. HVAC system is system type 8 and is incorrectly modeled with a chilled water Loop design return temperature. Expected result: FAIL	fail	rule22-2.json
HVAC_CHW-2	HVAC_CHW-2-e	The project has one building segment with one zone. HVAC system is system type 2 and has no chilled water Loop. Expected result: Not Applicable	not_applicable	rule22-2.json
HVAC_CHW-20	HVAC_CHW-20-a	The project has one building segment with two zones. climate zone 4A. HVAC is system type 7 and is correctly modeled with cooling tower leaving water setpoint temperature of 75F. Expected result: PASS	pass	rule22-20.json
HVAC_CHW-20	HVAC_CHW-20-b	The project has one building segment with two zones. climate zone 4A. HVAC is system type 7 and is incorrectly modeled with cooling tower leaving water setpoint temperature of 80F. Expected result: FAIL	fail	rule22-20.json
HVAC_CHW-20	HVAC_CHW-20-c	The project has one building segment with two zones. climate zone 6B. HVAC is system type 8 and is correctly modeled with cooling tower leaving water setpoint temperature of 75F. Expected result: PASS	pass	rule22-20.json
HVAC_CHW-20	HVAC_CHW-20-d	The project has one building segment with two zones. climate zone 6B. HVAC is system type 8 and is incorrectly modeled with cooling tower leaving water setpoint temperature of 70F. Expected result: FAIL	fail	rule22-20.json
HVAC_CHW-20	HVAC_CHW-20-e	The project has one building segment with one zone. HVAC is system type 12a and does not have a chiller plant.. Expected result: Not Applicable	not_applicable	rule22-20.json
HVAC_CHW-21	HVAC_CHW-21-a	The project has one building segment with two zones. HVAC is system type 7 with < 600 ton chiller and is correctly modeled with a screw chiller. Expected output: PASS	pass	rule22-21.json
HVAC_CHW-21	HVAC_CHW-21-b	The project has one building segment with two zones. HVAC is system type 7 with < 600 ton chiller and is not correctly modeled with a positive displacement chiller. Expected output: FAIL	fail	rule22-21.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-21	HVAC_CHW-21-c	The project has one building segment with two zones. HVAC is system type 8b with > 600 ton chiller and is correctly modeled with a centrifugal chiller. Expected result: PASS	pass	rule22-21.json
HVAC_CHW-21	HVAC_CHW-21-d	The project has one building segment with two zones. HVAC is system type 8b with > 600 ton chiller and is incorrectly modeled with a Screw chiller. Expected result: FAIL	fail	rule22-21.json
HVAC_CHW-21	HVAC_CHW-21-e	The project has one building segment with one zone. HVAC is system type 1 with no chilled water. Expected result: Not Applicable	not_applicable	rule22-21.json
HVAC_CHW-22	HVAC_CHW-22-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the chiller rated capacity and full load efficiency in accordance with Table G3.5.3. Expected result: PASS	pass	rule22-22.json
HVAC_CHW-22	HVAC_CHW-22-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the chiller rated capacity and full load efficiency not in accordance with Table G3.5.3. Expected result: FAIL	fail	rule22-22.json
HVAC_CHW-22	HVAC_CHW-22-c	The project has one building segment with one zone. HVAC is system type 13 and is correctly modeled with the chiller rated capacity and full load efficiency in accordance with Table G3.5.3. Expected result: PASS	pass	rule22-22.json
HVAC_CHW-22	HVAC_CHW-22-d	The project has one building segment with one zone. HVAC is system type 13 and is incorrectly modeled with the chiller rated capacity and full load efficiency not in accordance with Table G3.5.3. Expected result: FAIL	fail	rule22-22.json
HVAC_CHW-22	HVAC_CHW-22-e	The project has one building segment with one zone. HVAC is system type 2 and does not have a chilled water system. Expected result: Not Applicable	not_applicable	rule22-22.json
HVAC_CHW-23	HVAC_CHW-23-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the is_chilled_water_pump_interlocked set to true and one pump per chiller. Expected result: PASS	pass	rule22-23.json
HVAC_CHW-23	HVAC_CHW-23-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the is_chilled_water_pump_interlocked set to false for associated chiller pump. Expected result: FAIL	fail	rule22-23.json
HVAC_CHW-23	HVAC_CHW-23-c	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with two chillers and only one pump. The is_chilled_water_pump_interlocked set to true for both chillers. Expected result: FAIL	fail	rule22-23.json
HVAC_CHW-23	HVAC_CHW-23-d	The project has one building segment with two zones. HVAC is system type 8 and is correctly modeled with the is_chilled_water_pump_interlocked set to true and one pump per chiller. Expected result: PASS	pass	rule22-23.json
HVAC_CHW-23	HVAC_CHW-23-e	The project has one building segment with two zones. HVAC is system type 8 and is incorrectly modeled with two primary chilled water pumps and one chiller. Expected result: FAIL	fail	rule22-23.json
HVAC_CHW-23	HVAC_CHW-23-f	The project has one building segment with one zone. HVAC is system type 2 and does not have chilled water. Expected result: Not Applicable	not_applicable	rule22-23.json
HVAC_CHW-24	HVAC_CHW-24-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with primary pump set to constant volume. Expected result: PASS	pass	rule22-24.json
HVAC_CHW-24	HVAC_CHW-24-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with primary pump set to variable volume. Expected result: FAIL	fail	rule22-24.json
HVAC_CHW-24	HVAC_CHW-24-c	The project has one building segment with two zones. HVAC is system type 8b and is correctly modeled with primary pump set to constant volume. Expected result: PASS	pass	rule22-24.json
HVAC_CHW-24	HVAC_CHW-24-d	The project has one building segment with two zones. HVAC is system type 8b and is incorrectly modeled with primary pump set to variable volume. Expected result: FAIL	fail	rule22-24.json
HVAC_CHW-24	HVAC_CHW-24-e	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled withluta secondary loop. Expected result: Not Applicable	not_applicable	rule22-24.json
HVAC_CHW-25	HVAC_CHW-25-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the primary chilled water pump having 9 w/gpm. Expected result: PASS	pass	rule22-25.json
HVAC_CHW-25	HVAC_CHW-25-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the primary chilled water pump having 11 w/gpm. Expected result: FAIL	fail	rule22-25.json
HVAC_CHW-25	HVAC_CHW-25-c	The project has one building segment with one zone. HVAC is system type 12 and is correctly modeled with the primary chilled water pump having 9 w/gpm. Expected result: PASS	pass	rule22-25.json
HVAC_CHW-25	HVAC_CHW-25-d	The project has one building segment with one zone. HVAC is system type 12 and is incorrectly modeled with the primary chilled water pump having 11 w/gpm. Expected result: FAIL	fail	rule22-25.json
HVAC_CHW-25	HVAC_CHW-25-e	The project has one building segment with one zone. HVAC is system type 11.2 Expected result: Not Applicable	not_applicable	rule22-25.json
HVAC_CHW-26	HVAC_CHW-26-a	The project has one building segment with one zone. HVAC is system type 11.1 and is correctly modeled with a 12 W/gpm primary pump. Expected result: PASS	pass	rule22-26.json
HVAC_CHW-26	HVAC_CHW-26-b	The project has one building segment with one zone. HVAC is system type 11.1 and is incorrectly modeled with a 15 W/gpm primary pump. Expected result: FAIL	fail	rule22-26.json
HVAC_CHW-26	HVAC_CHW-26-c	The project has one building segment with one zone. HVAC is system type 11.2 and is correctly modeled with a 12 W/gpm primary pump. Expected result: PASS	pass	rule22-26.json
HVAC_CHW-26	HVAC_CHW-26-d	The project has one building segment with one zone. HVAC is system type 11.2 and is incorrectly modeled with a 15 W/gpm primary pump. Expected result: FAIL	fail	rule22-26.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-26	HVAC_CHW-26-e	The project has one building segment with one zone. HVAC is system type 12. Expected result: Not Applicable	not_applicable	rule22-26.json
HVAC_CHW-27	HVAC_CHW-27-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the is_condenser_water_pump_interlocked key set to true. Expected Result: PASS	pass	rule22-27.json
HVAC_CHW-27	HVAC_CHW-27-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the is_condenser_water_pump_interlocked key set to false. Expected Result: FAIL	fail	rule22-27.json
HVAC_CHW-27	HVAC_CHW-27-c	The project has one building segment with one zone. HVAC is system type 12b and is correctly modeled with the is_condenser_water_pump_interlocked key set to true. Expected Result: PASS	pass	rule22-27.json
HVAC_CHW-27	HVAC_CHW-27-d	The project has one building segment with one zone. HVAC is system type 12b and is incorrectly modeled with the is_condenser_water_pump_interlocked key set to false. Expected Result: FAIL	fail	rule22-27.json
HVAC_CHW-27	HVAC_CHW-27-e	The project has one building segment with one zone. HVAC is system type 4 and does not have a chilled water plant. Expected Result: Not Applicable	not_applicable	rule22-27.json
HVAC_CHW-28	HVAC_CHW-28-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with a condenser pump that is constant volume. Expected Result: PASS	pass	rule22-28.json
HVAC_CHW-28	HVAC_CHW-28-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with a condenser pump that is variable volume. Expected result: FAIL	fail	rule22-28.json
HVAC_CHW-28	HVAC_CHW-28-c	The project has one building segment with one zone. HVAC is system type 4 and does not have a chilled water plant. Expected Result: Not Applicable	not_applicable	rule22-28.json
HVAC_CHW-29	HVAC_CHW-29-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with a condenser pump value of 19 W/GPM. Expected Result: PASS	pass	rule22-29.json
HVAC_CHW-29	HVAC_CHW-29-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with a condenser pump value of 21 W/GPM. Expected result: FAIL	fail	rule22-29.json
HVAC_CHW-29	HVAC_CHW-29-c	The project has one building segment with one zone. HVAC is system type 13 and is correctly modeled with a condenser pump value of 19 W/GPM. Expected Result: PASS	pass	rule22-29.json
HVAC_CHW-29	HVAC_CHW-29-d	The project has one building segment with one zone. HVAC is system type 13 and is incorrectly modeled with a condenser pump value of 21 W/GPM. Expected result: FAIL	fail	rule22-29.json
HVAC_CHW-29	HVAC_CHW-29-e	The project has one building segment with one zone. HVAC is system type 11.1b. Expected result: NOT APPLICABLE	not_applicable	rule22-29.json
HVAC_CHW-3	HVAC_CHW-3-a	The project has one building segment with two zones. HVAC is system type 7 and chilled water Loop is correctly modeled with a temperature reset setpoint. Expected result: PASS	pass	rule22-3.json
HVAC_CHW-3	HVAC_CHW-3-b	The project has one building segment with two zones. HVAC is system type 7 and chilled water Loop is incorrectly modeled with a constant temperature setpoint. Expected result: FAIL	fail	rule22-3.json
HVAC_CHW-3	HVAC_CHW-3-c	The project has one building segment with two zones. HVAC is system type 8b and chilled water Loop is correctly modeled with a temperature reset setpoint. Expected result: PASS	pass	rule22-3.json
HVAC_CHW-3	HVAC_CHW-3-d	The project has one building segment with two zones. HVAC is system type 8b and chilled water Loop is incorrectly modeled with a constant temperature setpoint. Expected result: FAIL	fail	rule22-3.json
HVAC_CHW-3	HVAC_CHW-3-e	The project has one building segment with one zone. HVAC is system type 11.2. Expected result: Not Applicable	not_applicable	rule22-3.json
HVAC_CHW-30	HVAC_CHW-30-a	The project has one building segment with one zone. HVAC is system type 11.1 and is correctly modeled with the condenser pump value of 22 W/gpm. Expected result: PASS	pass	rule22-30.json
HVAC_CHW-30	HVAC_CHW-30-b	The project has one building segment with one zone. HVAC is system type 11.1 and is incorrectly modeled with the condenser pump value of 25 W/gpm. Expected result: FAIL	fail	rule22-30.json
HVAC_CHW-30	HVAC_CHW-30-c	The project has one building segment with one zone. HVAC is system type 11.2 and is correctly modeled with the condenser pump value of 22 W/gpm. Expected result: PASS	pass	rule22-30.json
HVAC_CHW-30	HVAC_CHW-30-d	The project has one building segment with one zone. HVAC is system type 11.2 and is incorrectly modeled with the condenser pump value of 25 W/gpm. Expected result: FAIL	fail	rule22-30.json
HVAC_CHW-30	HVAC_CHW-30-e	The project has one building segment with two zones. HVAC is system type 7. Expected result: Not Applicable	not_applicable	rule22-30.json
HVAC_CHW-31	HVAC_CHW-31-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with 1 chiller when the cooling peak load is 300 tons or less. Expected result: PASS	pass	rule22-31.json
HVAC_CHW-31	HVAC_CHW-31-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with 2 chillers when the cooling peak load is 300 tons or less. Expected result: FAIL	fail	rule22-31.json
HVAC_CHW-31	HVAC_CHW-31-c	The project has one building segment with two zones. HVAC is system type 7b and is correctly modeled with 2 chillers when the cooling peak load is between 300 -> 600 tons. Expected result: PASS	pass	rule22-31.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-31	HVAC_CHW-31-d	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with 1 chiller when the cooling peak load is between 300 -> 600 tons. Expected result: FAIL	fail	rule22-31.json
HVAC_CHW-31	HVAC_CHW-31-e	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with 3 chillers when the cooling peak load is 2400 tons. Expected result: PASS	pass	rule22-31.json
HVAC_CHW-31	HVAC_CHW-31-f	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with 2 chillers when the cooling peak load is 2400 tons. Expected result: FAIL	fail	rule22-31.json
HVAC_CHW-31	HVAC_CHW-31-g	The project has one building segment with two zones. HVAC is system type 5. Expected result: Not Applicable	not_applicable	rule22-31.json
HVAC_CHW-32	HVAC_CHW-32-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the chiller part_load_efficiency correctly matching the value in Table G3.5.3 part_load_efficiency_metric set to INTEGRATED_PART_LOAD_VALUE. Expected result: PASS	pass	rule22-32.json
HVAC_CHW-32	HVAC_CHW-32-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the part_load_efficiency_metric set to NONSTANDARD_PART_LOAD_VALUE. Expected result: FAIL	fail	rule22-32.json
HVAC_CHW-32	HVAC_CHW-32-c	The project has one building segment with two zones. HVAC is system type 7 and is modeled with the part_load_efficiency_metric correctly set to INTEGRATED_PART_LOAD_VALUE, but an incorrect part_load_efficiency. Expected result: FAIL	fail	rule22-32.json
HVAC_CHW-32	HVAC_CHW-32-d	The project has one building segment with two zones. HVAC is system type 8 and is correctly modeled with the chiller part_load_efficiency correctly matching the value in Table G3.5.3 part_load_efficiency_metric set to INTEGRATED_PART_LOAD_VALUE. Expected result: PASS	pass	rule22-32.json
HVAC_CHW-32	HVAC_CHW-32-e	The project has one building segment with two zones. HVAC is system type 8 and is incorrectly modeled with the part_load_efficiency_metric set to NONSTANDARD_PART_LOAD_VALUE. Expected result: FAIL	fail	rule22-32.json
HVAC_CHW-32	HVAC_CHW-32-f	The project has one building segment with two zones. HVAC is system type 8 and is modeled with the part_load_efficiency_metric correctly set to INTEGRATED_PART_LOAD_VALUE, but an incorrect part_load_efficiency. Expected result: FAIL	fail	rule22-32.json
HVAC_CHW-32	HVAC_CHW-32-g	The project has one building segment with two zones. HVAC is system type 6 and does not have a chilled water plant. Expected result: Not Applicable	not_applicable	rule22-32.json
HVAC_CHW-33	HVAC_CHW-33-a	The project has one building segment with two zones. HVAC is system type 8 and is correctly modeled with the correct number of one primary and one secondary chilled water loop. Expected result: PASS	pass	rule22-33.json
HVAC_CHW-33	HVAC_CHW-33-b	The project has one building segment with two zones. HVAC is system type 8 and is incorrectly modeled with two secondary chilled water loops. Expected result: FAIL	fail	rule22-33.json
HVAC_CHW-33	HVAC_CHW-33-c	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with one primary and one secondary chilled water loop. Expected result: PASS	pass	rule22-33.json
HVAC_CHW-33	HVAC_CHW-33-d	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled without a secondary chilled water loop. Expected result: FAIL	fail	rule22-33.json
HVAC_CHW-33	HVAC_CHW-33-e	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with two primary chilled water loops. Expected result: FAIL	fail	rule22-33.json
HVAC_CHW-33	HVAC_CHW-33-f	The project has one building segment with two zones. HVAC is system type 7a and does not have chillers. Expected result: Not Applicable	not_applicable	rule22-33.json
HVAC_CHW-34	HVAC_CHW-34-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with chilled water plant sized using coincident loads. Expected result: PASS	pass	rule22-34.json
HVAC_CHW-34	HVAC_CHW-34-b	The project has one building segment with two zones. HVAC is system type 7 and is modeled with chilled water plant incorrectly sized not using coincident loads. Expected result: FAIL	fail	rule22-34.json
HVAC_CHW-34	HVAC_CHW-34-c	The project has one building segment with two zones. HVAC is system type 8b and is correctly modeled with chilled water plant sized using coincident loads. Expected result: PASS	pass	rule22-34.json
HVAC_CHW-34	HVAC_CHW-34-d	The project has one building segment with two zones. HVAC is system type 8b and is modeled with chilled water plant incorrectly sized not using coincident loads. Expected result: FAIL	fail	rule22-34.json
HVAC_CHW-34	HVAC_CHW-34-e	The project has one building segment with one zone. HVAC is system type 9 and does not have a chilled water plant. Expected result: Not Applicable	not_applicable	rule22-34.json
HVAC_CHW-35	HVAC_CHW-35-a	The project has one building segment with two zones. This rule does not apply. Expected result: Not Applicable	not_applicable	rule22-35.json
HVAC_CHW-35	HVAC_CHW-35-b	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and correctly does not have chilled water reset. Expected result: Undetermined	undetermined	rule22-35.json
HVAC_CHW-35	HVAC_CHW-35-c	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and incorrectly has chilled water reset. Expected result: Undetermined	undetermined	rule22-35.json
HVAC_CHW-36	HVAC_CHW-36-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with constant primary/ variable secondary flow_control keys. Expected result: PASS	pass	rule22-36.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-36	HVAC_CHW-36-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with variable flow primary loop. Expected result: FAIL	fail	rule22-36.json
HVAC_CHW-36	HVAC_CHW-36-c	The project has one building segment with one zone. HVAC is system type 13 and is correctly modeled with constant primary/ variable secondary flow_control keys. Expected result: PASS	pass	rule22-36.json
HVAC_CHW-36	HVAC_CHW-36-d	The project has one building segment with one zone. HVAC is system type 13 and is incorrectly modeled with constant flow secondary loop. Expected result: FAIL	fail	rule22-36.json
HVAC_CHW-36	HVAC_CHW-36-e	The project has one building segment with one zone. HVAC is system type 10 and does not have a chilled water plant. Expected result: Not Applicable	not_applicable	rule22-36.json
HVAC_CHW-37	HVAC_CHW-37-a	The project has one building segment with two zones. Baseline building does not have purchase chilled water. Expected result: Not Applicable	not_applicable	rule22-37.json
HVAC_CHW-37	HVAC_CHW-37-b	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and correctly has a variable speed distribution pump. Expected result: Undetermined	undetermined	rule22-37.json
HVAC_CHW-37	HVAC_CHW-37-c	The project has one building segment with two zones. Expected result: Undetermined	undetermined	rule22-37.json
HVAC_CHW-38	HVAC_CHW-38-a	The project has one building segment with two zones. Baseline building does not have purchase chilled water. Expected result: Not Applicable	not_applicable	rule22-38.json
HVAC_CHW-38	HVAC_CHW-38-b	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and correctly has a 25% minimum flow setpoint. Expected result: Undetermined	undetermined	rule22-38.json
HVAC_CHW-38	HVAC_CHW-38-c	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and incorrectly has a 40% minimum flow setpoint. Expected result: Undetermined	undetermined	rule22-38.json
HVAC_CHW-39	HVAC_CHW-39-a	The project has one building segment with two zones. Baseline building does not have purchase chilled water. Expected result: Not Applicable	not_applicable	rule22-39.json
HVAC_CHW-39	HVAC_CHW-39-b	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and correctly has a pump power of 16 W/gpm. Expected result: Undetermined	undetermined	rule22-39.json
HVAC_CHW-39	HVAC_CHW-39-c	The project has one building segment with two zones. Baseline building is modeled with purchased chilled water and incorrectly has a pump power of 20 W/gpm. Expected result: Undetermined	undetermined	rule22-39.json
HVAC_CHW-4	HVAC_CHW-4-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with outdoor air reset for chilled water loop supply temperature control. Expected result: PASS	pass	rule22-4.json
HVAC_CHW-4	HVAC_CHW-4-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with incorrect value for outdoor_high_for_loop_supply_reset_temperature for chilled water loop supply temperature control. Expected Result: FAIL	fail	rule22-4.json
HVAC_CHW-4	HVAC_CHW-4-c	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with incorrect value for outdoor_low_for_loop_supply_reset_temperature for chilled water loop supply temperature control. Expected Result: FAIL	fail	rule22-4.json
HVAC_CHW-4	HVAC_CHW-4-d	The project has one building segment with one zone. HVAC is system type 12 and is correctly modeled with outdoor air reset for chilled water loop supply temperature control. Expected result: PASS	pass	rule22-4.json
HVAC_CHW-4	HVAC_CHW-4-e	The project has one building segment with one zone. HVAC is system type 12 and is incorrectly modeled with incorrect value for loop_supply_temperature_at_outdoor_high for chilled water loop supply temperature control. Expected result: FAIL	fail	rule22-4.json
HVAC_CHW-4	HVAC_CHW-4-f	The project has one building segment with one zone. HVAC is system type 12 and is incorrectly modeled with incorrect value for loop_supply_temperature_at_outdoor_low for chilled water loop supply temperature control. Expected result: FAIL	fail	rule22-4.json
HVAC_CHW-4	HVAC_CHW-4-g	The project has one building segment with one zone. HVAC is system type 11.1a and does not have a chiller. Expected result: Not Applicable	not_applicable	rule22-4.json
HVAC_CHW-40	HVAC_CHW-40-a	The project has one building segment with two zones. Purchased chilled water is modeled in both the proposed and baseline systems for building utilizing system 7c. Expected result: PASS	pass	rule22-40.json
HVAC_CHW-40	HVAC_CHW-40-b	The project has one building segment with two zones. Purchased chilled water is modeled in the proposed model, but baseline uses a chilled water plant (system 7). Expected result: FAIL	fail	rule22-40.json
HVAC_CHW-40	HVAC_CHW-40-c	The project has one building segment with one zone. Purchased chilled water is modeled in the proposed model, but baseline uses DX cooling (system 1). Expected result: FAIL	fail	rule22-40.json
HVAC_CHW-40	HVAC_CHW-40-d	The project has one building segment with one zone. Purchased chilled water is not modeled in the proposed model. Both proposed and baseline are modeled with system type 2. Expected result: Not Applicable	not_applicable	rule22-40.json
HVAC_CHW-41	HVAC_CHW-41-a	The project has one building segment with two zones. Purchased chilled water systems modeled with only one external fluid loop in the baseline design. Expected result: Undetermined	undetermined	rule22-41.json
HVAC_CHW-41	HVAC_CHW-41-b	The project has one building segment with two zones. Purchased chilled water systems modeled with two external fluid loops in the baseline design. Expected result: Undetermined	undetermined	rule22-41.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_CHW-41	HVAC_CHW-41-c	The project has one building segment with two zones. Baseline building does not utilize purchased chilled water and does not apply to rule 22-41. Expected result: Undetermined	not_applicable	rule22-41.json
HVAC_CHW-5	HVAC_CHW-5-a	The project has one building segment with one zone. HVAC is system type 11.1 air-side system and is correctly modeled with temperature_reset_type. Expected result: PASS	pass	rule22-5.json
HVAC_CHW-5	HVAC_CHW-5-b	The project has one building segment with one zone. HVAC is system type 11.1 air-side system and is incorrectly modeled with temperature_reset_type. Expected result: FAIL	fail	rule22-5.json
HVAC_CHW-5	HVAC_CHW-5-c	The project has one building segment with one zone. HVAC is system type 11.1c air-side system and is correctly modeled with temperature_reset_type. Expected result: PASS	pass	rule22-5.json
HVAC_CHW-5	HVAC_CHW-5-d	The project has one building segment with one zone. HVAC is system type 11.1c air-side system and is incorrectly modeled with temperature_reset_type. Expected result: FAIL	fail	rule22-5.json
HVAC_CHW-6	HVAC_CHW-6-a	The project has one building segment with one zone. HVAC is system type 11.1 air-side system and is correctly modeled with loop_supply_temperature_at_low_load set to 54F. Expected outcome: PASS	pass	rule22-6.json
HVAC_CHW-6	HVAC_CHW-6-b	The project has one building segment with one zone. HVAC is system type 11.1 air-side system and is incorrectly modeled with loop_supply_temperature_at_low_load set to 64F. Expected outcome: FAIL	fail	rule22-6.json
HVAC_CHW-6	HVAC_CHW-6-c	The project has one building segment with one zone. HVAC is system type 11.1b air-side system and is correctly modeled with loop_supply_temperature_at_low_load set to 54F. Expected outcome: PASS	pass	rule22-6.json
HVAC_CHW-6	HVAC_CHW-6-d	The project has one building segment with one zone. HVAC is system type 11.1b air-side system and is incorrectly modeled with loop_supply_temperature_at_low_load set to 64F. Expected outcome: FAIL	fail	rule22-6.json
HVAC_CHW-6	HVAC_CHW-6-e	The project has one building segment with two zones. HVAC is system type 8. Expected outcome: Not Applicable	not_applicable	rule22-6.json
HVAC_CHW-7	HVAC_CHW-7-a	The project has one building segment with two zones. HVAC is system type 7 and is correctly modeled with the primary/secondary loops. Expected result: PASS	pass	rule22-7.json
HVAC_CHW-7	HVAC_CHW-7-b	The project has one building segment with two zones. HVAC is system type 7 and is incorrectly modeled with the primary/secondary loops. Expected result: FAIL	fail	rule22-7.json
HVAC_CHW-7	HVAC_CHW-7-c	The project has one building segment with two zones. HVAC is system type 7b and is correctly modeled with the primary/secondary loops. Expected result: PASS	pass	rule22-7.json
HVAC_CHW-7	HVAC_CHW-7-d	The project has one building segment with two zones. HVAC is system type 7b and is incorrectly modeled with the primary/secondary loops. Expected result: FAIL	fail	rule22-7.json
HVAC_CHW-7	HVAC_CHW-7-e	The project has one building segment with one zone. HVAC is system type 9 and does not have a chilled water system. Expected result: Not Applicable	not_applicable	rule22-7.json
HVAC_CHW-8	HVAC_CHW-8-a	The project has one building segment with two zones. HVAC is system type 7 having more than 300 ton capacity and is correctly modeled with the secondary pump having a vfd. Expected result: PASS	pass	rule22-8.json
HVAC_CHW-8	HVAC_CHW-8-b	The project has one building segment with two zones. HVAC is system type 7 having more than 300 ton capacity and is incorrectly modeled with the secondary pump operating without vfd. Expected result: FAIL	fail	rule22-8.json
HVAC_CHW-8	HVAC_CHW-8-c	The project has one building segment with two zones. HVAC is system type 7 having less than 300 ton capacity. Expected result: Not Applicable	not_applicable	rule22-8.json
HVAC_CHW-8	HVAC_CHW-8-d	The project has one building segment with one zone. HVAC is system type 7 having more than 300 ton capacity and is correctly modeled with the secondary pump having a vfd. Expected result: PASS	pass	rule22-8.json
HVAC_CHW-8	HVAC_CHW-8-e	The project has one building segment with one zone. HVAC is system type 12 having more than 300 ton capacity and is incorrectly modeled with the secondary pump operating without vfd. Expected result: FAIL	fail	rule22-8.json
HVAC_CHW-9	HVAC_CHW-9-a	The project has one building segment with two zones. HVAC is system type 7 with more than 300 tons cooling capacity. It is correctly modeled with the secondary cooling loop minimum flow equal to 25% of design flow. Expected result: PASS	pass	rule22-9.json
HVAC_CHW-9	HVAC_CHW-9-b	The project has one building segment with two zones. HVAC is system type 7 with more than 300 tons cooling capacity. It is incorrectly modeled with the secondary cooling loop minimum flow equal to 35% of design flow. Expected result: FAIL	fail	rule22-9.json
HVAC_CHW-9	HVAC_CHW-9-c	The project has one building segment with two zones. HVAC is system type 7 with less than 300 tons cooling capacity. Expected result: Undetermined	undetermined	rule22-9.json
HVAC_CHW-9	HVAC_CHW-9-d	The project has one building segment with one zone. HVAC is system type 13 with more than 300 tons cooling capacity. It is correctly modeled with the secondary cooling loop minimum flow equal to 25% of design flow. Expected result: PASS	pass	rule22-9.json
HVAC_CHW-9	HVAC_CHW-9-e	The project has one building segment with one zone. HVAC is system type 13 with more than 300 tons cooling capacity. It is incorrectly modeled with the secondary cooling loop minimum flow equal to 35% of design flow. Expected result: FAIL	fail	rule22-9.json
HVAC_SPEC-1	HVAC_SPEC-1-a	The project has one building segment with one zone served by baseline system 2 with a heatpump low shut off of less than 17 F. The expected result is: pass	pass	rule23-1.json
HVAC_SPEC-1	HVAC_SPEC-1-b	The project has one building segment with one zone served by baseline system 2 with a heatpump low shut off greater than 25 F. The expected result is: fail	fail	rule23-1.json
HVAC_SPEC-1	HVAC_SPEC-1-c	The project has one building segment with one zone served by baseline system 2 with a heatpump low shut off between 17 F and 25 F. The expected result is: undetermined	undetermined	rule23-1.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_SPEC-1	HVAC_SPEC-1-d	The project has one building segment with one zone served by baseline System 4 with a heat pump low shut off temperature below 10 F. The expected result is: pass	pass	rule23-1.json
HVAC_SPEC-1	HVAC_SPEC-1-e	The project has one building segment with one zone served by baseline System 4 with a heat pump low shut off temperature above 10 F. The expected result is: fail	fail	rule23-1.json
HVAC_SPEC-10	HVAC_SPEC-10-a	The project has one building segment with one zone served by System 11 set to minimum airflow at 50% load. The expected result is: pass	pass	rule23-10.json
HVAC_SPEC-10	HVAC_SPEC-10-b	The project has one building segment with one zone served by System 11 set to minimum airflow set at 25% load. The expected result is: fail	fail	rule23-10.json
HVAC_SPEC-10	HVAC_SPEC-10-c	The project has one building segment with two zones served by System 7 set to minimum airflow at 25% load. The expected result is: not_applicable	not_applicable	rule23-10.json
HVAC_SPEC-11	HVAC_SPEC-11-a	The project has one building segment with one zone served by System 11 with supply air temperature reset set to LOAD_RESET_TO_SPACE_TEMPERATURE and has a reset load fraction of 50%. The expected result is: pass	pass	rule23-11.json
HVAC_SPEC-11	HVAC_SPEC-11-b	The project has one building segment with one zone served by System 11 with supply air temperature reset set to ZONE_RESET and has a reset temperature differential of 5 F. The expected result is: pass	pass	rule23-11.json
HVAC_SPEC-11	HVAC_SPEC-11-c	The project has one building segment with one zone served by System 11 with supply air temperature reset set to ZONE_RESET and has a reset temperature differential of 10 F. The expected result is: fail	fail	rule23-11.json
HVAC_SPEC-12	HVAC_SPEC-12-a	The project has one building segment with one zone served by System 11.1 and therefore is applicable to this rule. The expected result is: undetermined	undetermined	rule23-12.json
HVAC_SPEC-12	HVAC_SPEC-12-b	The project has one building segment with two zones served by System 7. Therefore, this rule no longer applies. The expected result is: not_applicable	not_applicable	rule23-12.json
HVAC_SPEC-13	HVAC_SPEC-13-a	The project has one building segment with one zone served by System 3. Proposed building utilizes System 3 with humidistatic controls. The baseline system 3 uses mechanical cooling for dehumidification to avoid overcooling. The expected result is: undetermined	undetermined	rule23-13.json
HVAC_SPEC-13	HVAC_SPEC-13-b	The project has one building segment with one zone served by System 3. Proposed building utilizes System 3 without dehumidification. Baseline building also has system 3. The expected result is: not_applicable	not_applicable	rule23-13.json
HVAC_SPEC-14	HVAC_SPEC-14-a	The project has one building segment with one zone served by System 3. Proposed building utilizes System 3 with humidistatic controls. The baseline building utilizes system 3 as well. The expected result is: undetermined	undetermined	rule23-14.json
HVAC_SPEC-14	HVAC_SPEC-14-b	The project has one building segment with one zone served by System 3. Proposed building utilizes System 3 without dehumidification. Baseline building also has system 3. The expected result is: not_applicable	not_applicable	rule23-14.json
HVAC_SPEC-15	HVAC_SPEC-15-a	The project has one building segment with one zone served by System 3. Proposed building utilizes System 3 with humidistatic controls. The baseline building utilizes system 3 as well. The expected result is: undetermined	undetermined	rule23-15.json
HVAC_SPEC-15	HVAC_SPEC-15-b	The project has one building segment with one zone served by System 3. Proposed building utilizes System 3 without dehumidification. Baseline building also has system 3. The expected result is: not_applicable	not_applicable	rule23-15.json
HVAC_SPEC-16	HVAC_SPEC-16-a	The project has one building segment with two zones served by System 7. The preheat coil is correctly controlled to 20 F less than the design room heating temperature setpoint. The expected result is: pass	pass	rule23-16.json
HVAC_SPEC-16	HVAC_SPEC-16-b	The project has one building segment with two zones served by System 7. The preheat coil is incorrectly controled to only 13 F less than the design room heating temperature setpoint. Should be 20 F. The expected result is: fail	fail	rule23-16.json
HVAC_SPEC-2	HVAC_SPEC-2-a	The project has one building segment with two zones served by baseline System 7 with a supply air temperature reset correctly set to 5 delta F. The expected result is: pass	pass	rule23-2.json
HVAC_SPEC-2	HVAC_SPEC-2-b	The project has one building segment with two zones served by baseline System 7 with supply air temperature reset but not correctly set to 5 delta F. The expected result is: fail	fail	rule23-2.json
HVAC_SPEC-2	HVAC_SPEC-2-c	The project has one building segment with two zones served by baseline System 7 with a does not have supply air temperature reset. The expected result is: fail	fail	rule23-2.json
HVAC_SPEC-3	HVAC_SPEC-3-a	The project has one building segment with two zones served by System 7. The minimum outdoor airflow in System 7 is acceptably exactly 30% of primary airflow in both terminals. The expected result is: pass	pass	rule23-3.json
HVAC_SPEC-3	HVAC_SPEC-3-b	The project has one building segment with two zones served by System 7. The minimum outdoor airflow in System 7 is acceptably greater than 30% of primary airflow in both terminals. The expected result is: pass	pass	rule23-3.json
HVAC_SPEC-3	HVAC_SPEC-3-c	The project has one building segment with two zones served by System 7. The minimum outdoor airflow in System 7 is incorrectly less than 30% of primary airflow in both terminals. The expected result is: fail	fail	rule23-3.json
HVAC_SPEC-4	HVAC_SPEC-4-a	The project has one building segment with two zones and one laboratory space served by baseline System 7. Per G3.1.1c, these systems must adjust lab exhaust and makeup air. The expected result is: undetermined	undetermined	rule23-4.json
HVAC_SPEC-4	HVAC_SPEC-4-b	The project has one building segment with one zone and one laboratory space served by baseline System 3. Per G3.1.1c, this only applies to system 5 and 7. The expected result is: not_applicable	not_applicable	rule23-4.json
HVAC_SPEC-5	HVAC_SPEC-5-a	Baseline system 6 with a terminal fan set to run at the first stage of heating before the reheat coil is turned on. Expected: PASS	pass	rule23-5.json
HVAC_SPEC-5	HVAC_SPEC-5-b	Baseline system 8 with a terminal fan set to run at the first stage of heating before the reheat coil is turned on. Expected: PASS	pass	rule23-5.json

Rule Unit Tests				
Rule ID	Rule Unit Test ID	Test_Description	Expected Rule Outcome	Rule Unit Test JSON
HVAC_SPEC-5	HVAC_SPEC-5-c	Baseline system 6 with a terminal fan NOT set to run at the first stage of heating before the reheat coil is turned on. Expected: FAIL	fail	rule23-5.json
HVAC_SPEC-5	HVAC_SPEC-5-d	Baseline system 8 with a terminal fan NOT set to run at the first stage of heating before the reheat coil is turned on. Expected: FAIL	fail	rule23-5.json
HVAC_SPEC-6	HVAC_SPEC-6-a	The project has one building segment with two zones served by system 6. VAV fans in system 6 are correctly sized to 50% of peak design load with a performance efficiency of 0.35 W/cfm. The expected result is: pass	pass	rule23-6.json
HVAC_SPEC-6	HVAC_SPEC-6-b	The project has one building segment with two zones served by system 6. VAV fans in system 6 are neither sized to 50% of peak design load nor and have performance efficiency of greater than 0.35 W/cfm. The expected result is: fail	fail	rule23-6.json
HVAC_SPEC-7	HVAC_SPEC-7-a	The project has one building segment with two zones served by system 6. System 6's fan system correctly specified temperature control as constant. The expected result is: pass	pass	rule23-7.json
HVAC_SPEC-7	HVAC_SPEC-7-b	The project has one building segment with two zones served by system 6. System 6's fan system incorrectly specified temperature control as outside air reset. The expected result is: fail	fail	rule23-7.json
HVAC_SPEC-8	HVAC_SPEC-8-a	The project has one building segment with two zones served by System 7. VAV fan follows the part load vav fan power as defined by method 1 in Table G3.1.3.15. The expected result is: pass	pass	rule23-8.json
HVAC_SPEC-8	HVAC_SPEC-8-b	The project has one building segment with two zones served by System 7. VAV fan does not follow the part load vav fan power defined by method 1 in Table G3.1.3.15. The expected result is: fail	fail	rule23-8.json
HVAC_SPEC-9	HVAC_SPEC-9-a	The project has one building segment with one zone served by System 11 with minimum volume setpoint set to 50% of the maximum design airflow rate. The expected result is: pass	pass	rule23-9.json
HVAC_SPEC-9	HVAC_SPEC-9-b	The project has one building segment with one zone served by System 11 with minimum volume setpoint set to greater than 50% of the maximum design airflow rate and minimum ventilation flow rate. The expected result is: undetermined	undetermined	rule23-9.json
HVAC_SPEC-9	HVAC_SPEC-9-c	The project has one building segment with one zone served by System 11 with minimum volume setpoint set to less than the minimum ventilation flow rate. The expected result is: fail	fail	rule23-9.json