Hazard Tool API Documentation

Flood

Required Input:

- Latitude/longitude

Output:

- *flood.features.attributes.FLD_ZONE*
  Flood zone classification of the selected site according to local flood hazard maps.
- *flood.features.attributes.STATIC_BFE*
  Base flood elevation (BFE) where applicable. If BFE is not applicable, this field will return a value of -9999.
- *flood.features.attributes.V_DATUM*
  Vertical datum used to determine BFE (e.g., NAVD 88), where applicable. If BFE is not applicable, this field will return an empty string.

Data Source:

- FEMA National Flood Hazard Layer - Effective Flood Hazard Layer for US, where modernized (https://msc.fema.gov/portal/search)

Ice

Required Input:

- Latitude/longitude
- Standard Version (7-10, 7-16, 7-22)
- Risk Category

Output:

7-10, 7-16

- *ice.attributes.ice_load*
  Equivalent radial ice thicknesses due to freezing rain for a 500-year mean recurrence interval, in inches.
- *ice.attributes.load_mms*
  Equivalent radial ice thicknesses due to freezing rain for a 500-year mean recurrence interval, in millimeters.
- *ice.attributes.conc_temp*
  Concurrent temperature, in degrees Fahrenheit.
- *ice.attributes.temp_C*
  Concurrent temperature, in degrees Celsius.

- *ice.attributes.gust_speed*
  Concurrent 3-s gust speed in miles per hour.
- *ice.attributes.gust_ms*
  Concurrent 3-s gust speed in meters per second.
- *ice.attributes.spec_zone*
  Indicates a special icing region.
    - In the Appalachian Mountains, ice thicknesses may vary significantly over short distances.
    - In the mountain west, ice thicknesses may exceed the mapped values in the foothills and passes. However, at elevations above 5,000 ft, freezing rain is unlikely.

7-22

- *ice.riskCategoryXX*
  "XX" is equal to the Risk Category supplied in the input; thus the label for this field will be *ice.riskCategory1*, *ice.riskCategory2*, etc. The value returned is the equivalent radial ice thickness due to freezing rain for 250, 500, 1,000, and 1,400-year mean recurrence intervals (for Risk Category I, II, III, and IV, respectively).
- *ice.temp.attributes.conc_temp*
  Concurrent air temperature in degrees Fahrenheit.
- *ice.temp.attributes.conc_temp_SI*
  Concurrent air temperature in degrees Celsius.
- *ice.gust*
  Concurrent 3-s gust speed in miles per hour.
- *ice.specialZones*
  Indicates special icing regions, with elevations above 2,100 ft (640 m) in the east, 6,000 ft (1829 m) in the west, and 1,600 ft (488 m) in Alaska, with sparse weather station data for determining design ice loads. In these regions, as well as in regions with complex terrain causing unusual icing conditions and regions where snow or in-cloud icing results in larger loads, the mapped values should be adjusted based on a combination of local historical records and experience, reanalysis data, and numerical weather prediction systems. If the site is not in a special icing region, the value of this field will be null.

Data Source:

- Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8
- Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
- Standard ASCE/SEI 7-22, Figs. 10-2 through 10-8

Rain

Required Input:

- Latitude/longitude

Output:

- *rain.groups*
  This field returns a table of precipitation frequency estimates in the form of a list of comma-separated values. The rows and columns of the table are as follows:

	Average recurrence interval (years)								
Duration	2	5	10	25	50	100	200	500	1,000
5-min:									
10-min:									
15-min:									
30-min:									
60-min:									
2-hr:									
3-hr:									
6-hr:									
12-hr:									
24-hr:									
2-day:									
3-day:									
4-day:									
7-day:									
10-day:									
20-day:									
30-day:									
45-day:									
60-day:									

  Each bracketed set of 9 values is a single row on the table. Each value is the median of a 90% confidence interval for a given duration and recurrence interval, given in inches/hour. Thus, to find the value for 15-min duration and 200-year mean recurrence interval, look for the 7th value (column) in the 3rd bracketed group (row); to find the value for 60-min duration and 200-year mean recurrence interval, look for the 7th value (column) in the 5th bracketed group (row); etc.

Data Source:

- NOAA National Weather Service, Precipitation Frequency Data Server, Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/index.html)

Seismic

Required Input

- Latitude/longitude
- Standard Version (7-10, 7-16, 7-22, 41-17, 41-23)
- Risk Category
- Site Soil Classification

Note: Available selections for soil class differ depending on the standard version selected. Using a soil class that does not apply to the selected standard version will result in an 'invalid input' error.

7-10 and 41-17	7-16	7-22 and 41-23
		Default
A – "Hard Rock"	A – "Hard Rock"	A – "Hard Rock"
B – "Rock"	B – "Rock";	B – "Rock"
	B (estimated) – see Section 11.4.3	BC
C – "Very dense soil and soft rock"	C – "Very dense soil and soft rock"	C – "Very dense soil and soft rock"
		CD
D – "Stiff Soil"	D – "Stiff Soil"	D – "Stiff Soil"
	D (default) – see Section 11.4.3	DE
E – "Soft Clay Soil"	E – "Soft Clay Soil"	E – "Soft Clay Soil"
F – Site Response Analysis	F – Site Response Analysis	

Output:

- Output values are taken from the USGS Seismic Design Web Services; documentation may be found at (https://earthquake.usgs.gov/ws/designmaps/).

Data Source:

- USGS Seismic Design Web Services (https://earthquake.usgs.gov/ws/designmaps/)

Snow

Required Input:

- Latitude/longitude
- Standard Version (7-10, 7-16, 7-22)
- Risk Category

Output

7-10

- *snow.snowResults.features.attributes.Display_1*
  Ground snow load in lb/ft^2. If this value reads "Case Study", a site-specific case study is required.
- *snow.snowResults.features.attributes.DisplaySI*
  Ground snow load in kN/m^2. If this value reads "Case Study", a site-specific case study is required.
- *snow.snowResults.features.attributes.ElevationXX_1* and *snow.snowResults.features.attributes.LoadXX_1*
  "XX" is a number from 1 to 4. Certain regions provide multiple snow load values for different elevations. In such cases, *ElevationXX_1* provides the upper elevation (in feet) for the

corresponding ground snow load (in lb/ft^2), which is given by *LoadXX_1*. Site-specific case studies are required to establish ground snow loads at elevations not covered.

7-16

- As above, except:
- If both *snow.snowResults.features.attributes.Display_1* and *snow.snowResults.features.attributes.DisplaySI* read "See Details", then the location is outside the bounds of Tables 7.2-1 through 7.2-8, and a local authority having jurisdiction (AHJ) should be consulted.
- *snow.snowResults.features.attributes.Details*
  If area is in a "See Details" region, this field provides a reference where additional snow load information can be found for that state.

7-22

- *snow.snowResults.riskCategoryXX*
  Ground snow load in lb/ft^2. "XX" is equal to the Risk Category supplied in the input; thus the label for this field will be *snow.snowResults.riskCategory1*, *snow.snowResults.riskCategory2*, etc.
- *snow.snowResults.mri20yr*
  Ground snow load value for 20-year MRI, in lb/ft^2.
- *snow.snowResults.winterWind*
  Winter wind parameter.

7-22 and site is in Alaska

- *snow.snowResults.attributes.ValueXX*
  "XX" is equal to the Risk Category supplied in the input. Thus *snow.snowResults.attributes.Value1*, *.Value2*, *.Value3*, and *.value4* display ground snow loads (in lb/ft^2) for risk categories I, II, III, and IV, respectively. 20-year MRI values are not provided.
- *snow.snowResults.attributes.WinterWind*
  Winter wind parameter.
- *snow.snowResults.attributes.Notes*
  If this field reads "See Details", then the following warning message applies: "*Statutory requirements of the Authority Having Jurisdiction are not included. For locations where there is substantial change in altitude over the city/town, the load applies at and below the cited elevation within the jurisdiction and up to 100 ft above the cited elevation unless otherwise noted. For locations in Anchorage/Eagle River and Homer above the cited elevation, the ground snow load shall be increased by 15% for every 100 ft above the cited elevation.*"

  If this field reads "Case Study", then a site-specific case study is required. The ground snow load value will be given as "0" (which should be understood as "N/A").

Data Source:

- ASCE/SEI 7-10, Fig. 7-1
- ASCE/SEI 7-16, Figure 7.2-1 and Tables 7.2-1 through 7.2-8

- ASCE/SEI 7-22, Figures 7.6-1 and 7.6-2 A-D

Tornado

Required Input:

- Latitude/longitude
- Standard Version (7-10, 7-16, 7-22)
- Risk Category (**Note:** Tornado hazard data only applies to Risk Category III or IV. If RC I or II is selected, the API will return no data.)

Output:

- *tornado.isRiskLevelApplicable*
  Indicates whether the Risk Category is applicable. If the selected Risk Category is I or II, this field will read "true", and no additional data is returned.
- *tornado.resultsArray*
  This field contains a series wind speed values corresponding to a given effective plan area (A_e) and a given MRI for each value.
  - *tornado.resultsArray.value*
    Tornado wind speed in mph.
  - *tornado.resultsArray.ae*
    Effective plan area in ft^2. The value "PT" indicates an effective plan area of 1 sq ft.
  - *tornado.resultsArray.mri*
    MRI in years.

  The following message applies to tornado hazard data: *"To select the appropriate tornado hazard map, the effective plan area, Ae, of the building, other structure, or facility, shall be determined in accordance with Section 32.5.4 and shall be rounded up to the next available mapped Ae. Alternatively, linear interpolation of tornado speed between maps using the logarithm of the effective plan area size is permitted, per Section 32.5.1*.

Data Source:

- ASCE/SEI Standard 7-22, Figs. 32.5-1, 32.5-2, and G.2-1 through -4

Tsunami

Required Input:

- Latitude/longitude
- Standard Version (7-16, 7-22)

Output:

- *tsunami.features*
  The Hazard Tool API only determines whether the selected site is or is not within the mapped tsunami design zone (TDZ). If the selected site is *within* the tsunami design zone, the *tsunami.features* field will return a JSON object containing GIS-related data about the

TDZ shape. If the site is *not* within the TDZ (or if the selected standard version is 7-10), the *tsunami.features* field will be empty.

- For more information, go to https://asce7tsunami.online/.

Data Source:

- ASCE Tsunami Design Geodatabase Version 2022-1.0 (https://asce7tsunami.online/)

Wind

Required Input:

- Latitude/longitude
- Standard Version (7-10, 7-16, 7-22)
- Risk Category (**Note:** Wind hazard data always provides wind speeds for all RCs in output; however, the user must still specify a specific RC in input)

Output:

- *wind.mriResults*
  3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours, in mph. Values are provided for multiple MRIs. "Default" wind speed MRI is based on Risk Category, as follows:

Risk Category	**MRI**
I	300-year
II	700-year
III	1,700-year
IV	3,000-year

- *wind.isHurricaneWindDebrisZone*
  Indicates whether the site is in a hurricane-prone region as defined in Section 26.2 of the selected standard.
- *wind.isHurricaneWindDebris1MileZone*
  Indicates whether the site is in a hurricane-prone region by virtue of being within 1 mile of the coast while having a windspeed of >130mph. This is an internal flag used by the program and is functionally the same as being in a hurricane-prone region as above.
- *wind.isSpecialWindZone*
  Indicates that the site is in a special wind region as shown in Fig. 26.5-1. If this value is "true", the site should be examined for unusual wind conditions. The Authority Having Jurisdiction shall, if necessary, adjust the values given in Fig. 26.5-1 to account for higher local wind speeds. Such adjustment shall be based on meteorological information and an estimate of the basic wind speed obtained in accordance with the provisions in Section 26.5.3.

Data Source:

- ASCE/SEI 7-10, Fig. 26.5-1B and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014
- ASCE/SEI 7-16, Fig. 26.5-1C and Figs. CC.2-1–CC.2-4, and Section 26.5.2
- ASCE/SEI 7-22, Fig. 26.5-1C and Figs. CC.2-1–CC.2-4, and Section 26.5.2