Simplified flow of subroutine MZNUMA

MZNUMA
esruhps/fematrx.f

Forward.

go to 123

- Initialize climate data and zone future air temperatures.
- Initialize control parameters.
- Set simulation start and finish days.
- Initialize the variable thermophysical properties flags.
- Initialize moisture modelling variables.
- Initialize the sparse storage variables.
- Perform the start-up period for 3D ground model if invoked.
- Calculate building side time step.

Loop through each day of the simulation. (do 10)

- Settle on the day and month numbers by "EDAYR".
- Settle on the day of the week by "EDAYR".
- Read climatic data.
- Read all shading / insolation information for present day by "MZSHDO".

Go into hour loop.

Loop through each hour of the day. (do 20)

Set present and future hour.

Select time-step, if required.

* Type 1 time-step controller.

Change time-step "type 1".

Yes

TSCON1
esruhld/tscon.f
Alter the current time-step.

COEFF1
esruhld/tscon.f
Modify the coefficients of arrays "C" and "QC".

No

* Type 2 time-step controller.

Adjust time-step "type 2".

Yes

Restore "C" & "QC" to their original values by COEFF1.

TSCON2
esruhld/tscon.f
Double the current timestep until the difference for zone air node energy injection for previous and current timestep is smaller than the user-specified value.

COEFF1
esruhld/tscon.f
Modify the coefficients of arrays "C" and "QC".

Complete hour step.

go to 27

Skip time step loop.

go to 28

No

* Type 3 time-step controller.

Get user-specified time-step "type 3".

Yes

COEFF1
esruhld/tscon.f
Modify the coefficients of arrays C and QC.

No

* Type 4 time-step controller.

Set iteration flag "type 4".

Yes

Set iteration flag.

No

Go into time loop.

Loop through each time step <= 1 hour. (do 30)

Global control.

go to 87

- Increment the simulation counter for every user-specified time-step.
- Set the future time-row hour value.
- Output current simulation increment if trace on.
- Determine climatic parameters at the present and future time row.

MZADJC
esruhld/adjc.f
Determine whether each construction in every zone is insulated, and calculate the corresponding 'sourceless' adjacent temperature and incident radiation values at the present and future time-rows.

* Determine for each component and surface, the defining index and the adjacent space temperature and radiation at the present and future time-rows. Also set up plant injection flow to zones. Also set up integrated containment zones already established by the coefficient generators.

First time-step only.

Not yet active.

go to 81

Yes

No

Loop through each zone in the model. (do 40)

Assign the starting values of zone temperature and energy injections to each node in the discretisation scheme by "MZNASG".

Loop through each zone in the model. (do 50)

Activate CFD model for relevant zone.

Loop through each zone in the model. (do 60)

MZCONV
esruhld/convect1.f
Compute all inside and outside convection coefficients.

The following is MZCONV flow.

MZCONV
esruhld/convect1.f

Loop through each zone in the model. (do 100)

INTERR
esruhld/convect1.f
Interrogates the configuration to determine the convection calculation approach to apply for each interior surface of the zone.

The following is INTERR flow.

INTERR
esruhld/convect1.f

SURFCONF
esruflx1/cfdgen5.f
Determine, on a time-step basis, whether to initiate a CFD analysis for the zone. If so, control alternation between BSim and CFD, then call subroutine "CFMNGE".

Call

Return

CFMNGE
esruflx1/cfdgen5.f
Control CFD calculation of convective heat transfer coefficients and results output when BSim and CFD are conflated.

CFCALC
esruflx1/Calc.f
CFD solution manager.

* Calculate CFD equations,such as mass conservation equation, momentum equation, turbulent energy equation, energy dissipation equation, energy equation, to obtain pressure, velocity and temperature..

CFCONV
esruflx1/tcoev.f
Calculate convection coefficients based on the CFD predictions.

Return to SURFCONF

Loop through each multi-layer construction. (do 101)

* Inside surface of mlc.

HTBUOY
esruhld/convect2.f
Calculates convective heat transfer coefficients for interior surfaces using empirical correlations.

ASSESS
esruhld/convect1.f
Decide whether to use the HTC calculated by empirical correlations or the HTC calculated by CFD for a given surface.

* Choose condition of the outside surface of mlc.

Face exterior environment.

HTCEXT
esruhld/convect2.f
Calculates convective heat transfer coefficients for forced flow on exterior surfaces.

Coupled to ground.

HTC = 1000

Face adjacent zone.

No calculation is performed.

Internal or adiabatic.

HTBUOY
esruhld/convect2.f
Calculates convective heat transfer coefficients for interior surfaces using empirical correlations.

Return to multi-layer construction loop of "MZCONV".

Multi-layer construction loop of "MZCONV".

Zone loop of "MZCONV".

Go into zone loop.

101 continue

HTOVER
esruhld/convect2.f
Override the calculated HTC values with the user-specified values specified in the .ihc file.

Return to zone loop of "MZCONV".

100 continue

OUTISN
esruhld/convect1.f
Set the convective HTCs for 'outside' surfaces which are 'interior' building surfaces.

Output convective heat transfer coefficient

Return to MZNUMA

Loop through each multi-layer construc. of the zone. (do 10)

Loop through inside and outside surface of mlc. (do 20)

Choose calculation approach.

SELCOR1
esruhld/convect2.f
Select the convection-calculation approach to use for a given surface based on the surface orientation, the direction of heat flow, and user-specified simulation toggle.

SELCOR2
esruhld/convect1.f
Select the convection-calculation approach if user has specified the correlation to use for each surface.

SELCOR3
esruhld/convect1.f
Allow adaptive control of the convection coefficient calculations if user has specified a 'control law' for each surface, and adjust how the calculations will adapt.

The following is SELECOR3 flow.

SELCOR3
esruhld/convect1.f

Select the controll low as follows,
CL 1: Toggle between correlations based on state of plant

injection within zone.
CL 2: VAV system with constant-temperature, variable-volume cooling and with variable-temperature, CONSTANT-volume heating.
CL 3: VAV system with constant-temperature, variable-volume cooling and with variable-temperature, VARIABLE-volume heating.
CL 4: Variable-temperature constant-air-volume system.

Some of the following subroutine will be called depending on selected controll low.

QPLANT
esruhld/convect1.f
Calculate the total plant heat injected or extracted to/from the zone for current time step.

QZONE
esruhld/convect1.f
Calculate the convective heat injected or extracted to/from the zone by the air-handling system.

SELVERC
esruhld/convect1.f
Select a forced or mixed flow correlation based on approach specified by user and based on surface orientation.

FSCALE
esruhld/convect1.f
calculates the scaling factor to translate the Fisher 'thesis' and Fisher & Pedersen correlations for forced convection to ESP-r's convection model.

Return to INTERR

* Specific correlations and adaptive control can be used for some surfaces while the standard selection (based on simulation toggle, surface orientation, and direction of heat flow) can be used for other surfaces.

Multi-layer construction loop of "INTERR".

Inside/outside loop of "INTERR"

20 continue

10 continue

Output computed convection coefficients.

Return to MZCONV

Rewind.

go to 123

Skip time step loop.

go to 28

Global control.

Day loop of "MZNUMA".

Hour loop of "MZNUMA".

Type 2 time step controller.

Time step loop of "MZNUMA".

Zone loop of "MZNUMA".

Plant time step loop of "MZNUMA".

Skip plant side.

Not yet active.

Global control.

Iteration

Return to Time step loop of "MZNUMA".

Return to hour loop of "MZNUMA".

Return to day loop of "MZNUMA".

Return to zone loop of "MZNUMA".

Return to multi-layer construction loop of "MZCONV".

Return to Plant time step loop of "MZNUMA".

Return to multi-layer construc. of the zone.

Return to inside/outside loop of "INTERR".

Return to Time step loop of "MZNUMA".

Skip time step loop of "MZNUMA".

Rewind.

Global control.

Skip time step loop.

Not yet active.

Iteration

Return to MZNUMA

Return to MZCONV

Return to MZCOES

Return to MZLS5

Return to MTXCTL

Return to MZMSTR

Return to MZLS3

Return to MZCOE3

Return to MZMRX1

Return to MZMRX2

Return to MZMRX3

Return to MZMRX4

Return to MZCOE4

Return to MZVENT

Return to MZNUMA

Return to MZCFMNGE

Return to MZCOM55

Return to MTXCTL

Return to MZCOE5

Return to MZCOE6

Return to MZCOE7

Return to MZCOE8

Return to MZCOE9

Return to MZCOE10

Return to MZCOE11

Return to MZCOE12

Return to MZCOE13

Return to MZCOE14

Return to MZCOE15

Return to MZCOE16

Return to MZCOE17

Return to