

TSPR HVAC System Data Entry Instructions and Example

The TSPR Tool includes an 'HVAC Schedule Entries' feature:

- This feature allows a user to create a 'mechanical equipment schedule' with as-designed system characteristics. The as-designed system characteristics are specified in the table for 'Schedule Entries'.
- WSEC requires a user to model systems with weighted average values when multiple systems of the same system type serve a block. The TSPR tool allows a user to identify the individual schedule entries that need to be combined and automatically calculate the weighted average efficiencies and fan power for the grouped equipment, as specified in the WSEC.

TSPR Tool Requirements

• Every building block must have a Primary Heating/Cooling System assigned to it. Primary Heating/Cooling Systems consist of either an Air Handler or Zone Equipment component that may be served by a plant loop or a VRF condenser unit.

View the <u>HVAC System Types</u> page of the TSPR User Guide for configuration and data entry guidelines, and the <u>Technical Terms</u> page for definitions of TSPR HVAC System parameters.

• All building HVAC components must have at least one equipment schedule entry (see the <u>Mechanical</u> <u>Equipment</u> page for details).

Equipment schedules entries may be created using either of the following two input approach options:

- **Option #1:** Enter equipment into tables provided for the schedule entries
- Option #2: Enter equipment directly from within 'HVAC Component' input screens

The following example lists the steps needed to enter an HVAC System with a **Packaged Air-source Heat Pump** and a **Dedicated Outdoor Air System** (DOAS) using both of the input approach options into the TSPR tool.

SF	PR ME E	xample		0 🔒	\$	2		B	¢°	0				e w	arnings	Score Buildin
				VRF Co	ndenser Units	Plant Lo	ops	Air Handlers	Termina	I Units Zone E	quipment					
1		- 10						Air Handler Schedule Entries 🧐					-50			
1	Equipmen	nt ID		Equipment Information		Cooli	ing Inform	nation			1	leating Inform	ation			Fan System
			Quantity	System Type	Cooling Source	Rated Capacity (Btu/h)	Efficier Units	ncy Rated s Efficiency	Calculated Efficiency	Heating Source	Fuel Type	Rated Capacity (Btu/h)	Efficiency Units	Rated Efficiency	Calculated Efficiency	Design Supply Airflow (CFM)
	RTU - 1		8	Pkgd Heat Pump	Central DX *	45000:0	EER	¥ 11.4	3.9 COP	Heat Pump	Electricity +	42000.0	COP +	4,3	4.6 COP	12000.0
	RTU - 2		12	Pkgd Heat Pump	Central DX •	36000.0	SEER	* 14.0	3.8 COP	Heat Pump	Electricity •	38000.0	HSPF .	7,9	3.8 COP	14000.0
	DOAS 1		3	Dedicated Outdoor Air System	No Cooling +	N/A	N/A	N/A	NA	No Heating	N/A	N/A	N/A	NA:	NA	5000.0
	DOAS 2		4	Dedicated Outdoor Air System	No Cooling +	N/A	N/A	NØ	NA	No Heating	N/A	N/A	NA	NA	NA	2500 0
	Add Equipment		_				_					_		Save Ai	r Handler Sc	hedule Entries
					M	echanical I	Equipr	ment Sched	ule: Air Ha	ndlers			_			
		Equipment ID	Q	uantity Rated Capacity	Rated Efficiency	Calculated Eff	iciency	Rated Capacity	Rated Effici	ency Calculated Effi	ciency Design	Supply Tota	al Fan Power	Calculated Far	Power	
		Air Handler 1 -	Pkgd He	at Pump 🖍 📋												
				1	Cooling - Central D)	ĸ			Heating - Hea	it Pump			Fan System			
		RTU - 1		8 45000.0 Btu/h 12 36000.0 Btu/h	11.4 EER 14.0 SEER	3.9 COP		42000.0 Btu/h 38000.0 Btu/h	4.3 COF 7.9 HSP	4.1 COP	12000.	0 CFM 0.	425 W/CFM	0 396 W/C	FM	
		DOAS (NH/NC) - Dedica	ted Outdoor Air System 🖍 1	t .									-		
					Cooling - No Cooling	9			Heating - No	Heating			Fan System			
		DOAS 1 DOAS 2		3 4							5000.0 2500.0	CFM 0.	819 W/CFM 792 W/CFM	0 808 W/C	FM	





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Example System: Packaged Air-source Heat Pump with DOAS

This system example includes multiple rooftop units with different capacities and different rated efficiencies

Input Option #1: Enter equipment into tables on the Mechanical Equipment screen

Step 1: Select the 'Mechanical Equipment' tab from the TSPR Toolbar



Step 2: Select the 'Air Handler' tab from the Mechanical Equipment Toolbar

VRF Condenser Units	Plant Loops	Air Handlers	Terminal Units	Zone Equipment
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Step 3: Select the blue 'Add Equipment' button from the Equipment Schedule Entries table

						A	ir Handler	Schedule Entri	es 😣	
Equipment ID		Equipment Information		Cool	ing Informatio	n			Н	leating Inform
	Quantity System Type		Cooling Source	Rated Capacity (Btu/h)	Efficiency Units	Rated Efficiency	Calculated Efficiency	Heating Source	Fuel Type	Rated Capacity (Btu/h)
Add Equipment								Save Ai	r Handler Sche	► dule Entries

Step 4: Complete all of the available input fields as highlighted in green; Select the blue 'Save' button

Quantity System Type Cooling Source Rated Capacity Units Efficiency Efficiency Efficiency Efficiency Calculated Efficiency Alridow (Capacity Carbon Control	Equipment ID			
8 Programaticity + 4000.0 EER + 11.4 39.00P Test Pump + Electicity + 4200.0 COP + 4.3 48.00P 1200.0				
12 Pkgd Heat Pump • Central DX • 36000 0 SEER • 140 38 COP Heat Pump • Electricity • 38000 0 HSPF • 7 9				
12 Pkgd Heat Pump Central OX 36000 0 SEER 14.0 38 COP Heat Pump Electricity 38000 0 HSPF 7.9 38 non	2			

Note:

- Enter a descriptive name for the Equipment ID
- Enter a quantity value for the number of pieces of equipment greater than 1 if grouping equipment with the same capacity, rated efficiency, air flow and fan power
- · Repeat this step to create unique schedule entries for equipment with different capacities, efficiencies or fan power
- · Required inputs with missing data will display a red 'This field is required' warning prompt
- If the 'Save' button is not selected, new or edited entries will be lost
- After saving, the tables auto convert rated heating and cooling system units to uniform units (e.g. to COP or Et), and auto adjust
 efficiencies to remove fan power at rated conditions and displays the new values in the 'Calculated Efficiency' columns, highlighted in
 blue.



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Input Option #1 Continued

Step 5: Repeat step 4 to add equipment schedules for DOAS equipment

- The 'System Type' should be specified as 'Dedicated Outdoor Air System'
- Note that for this example, we are assuming that the DOAS system uses no cooling or heating.

	Air Handler Schedule Entries													
Equipment ID		Equipment Information	Cooling Information					Heating Information Fa					Fan System	
	Quantity	System Type	Cooling Source	Rated Capacity (Btu/h)	Efficiency Units	Rated Efficiency	Calculated Efficiency	Heating Source	Fuel Type	Rated Capacity (Btu/h)	Efficiency Units	Rated Efficiency	Calculated Efficiency	Design Supply Airflow (CFM)
DOAS 1	3	Dedicated Outdoor Air System 🔹	No Cooling +	N/A	N/A	N/A	NA	No Heating 🔹	N/A	N/A	N/A	NA	NA	5000.0
DOAS 2	4	Dedicated Outdoor Air System 🔹	No Cooling 💌	N/A	N/A	N/A	NA	No Heating +	N/A	N/A	N/A	NA	NA.	2500.0

Step 6: Create an Air Handler to Group Individual Schedule Entries

Select the green 'Add' button below the HVAC equipment summary table:

	Mechanical Equipment Schedule: Air Handlers										
Equipment ID	Quantity	Rated Capacity	Rated Efficiency	Calculated Efficiency	Rated Capacity	Rated Efficiency	Calculated Efficiency	Design Supply Airflow	Total Fan Power	Calculated Fan Power	
										Add Air Handler	

Step 7: Assign name, select System Type, Cooling Source, and Heating Source for the Air Handler

Select 'Pkgd Heat Pump' as the System Type; 'Central DX' as the Cooling Source; and 'Heat Pump' as the Heating Source. Previously entered mechanical equipment schedule entries now appear under the 'Mechanical Equipment Schedule' section.

Step 8: Assign mechanical equipment entries

assign equipment to the Air Handler.

Click on the paper clip icons from the 'Attach' column

of the available mechanical equipment entries to

Name*	Air Handler 1	
System Type	Pkgd Heat Pump	,
Cooling Equipment		
Cooling Source*	Central DX	,
Heating Equipment		
Heating Source*	Heat Pump	
Fuel Type*	Electricity	÷
Condensor Tune		

Mechanical Equipment Schedule

Enter HVAC equipment information to calculate weighted average equipment efficiency and subtract supply fan power for packaged equipment

Existing unassigned mechanical equipment applicable to this system:

Equipment ID	Quantity	Cooling Efficiency	Heating Efficiency	Attach
RTU - 1	8	3.9 COP	4.6 COP	Ø
RTU - 2	12	3.8 COP	3.8 COP	Ø





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Fan Systems

Input Option #1 Continued

Step 9: Complete any remaining HVAC component required inputs and save

Select an appropriate option for Number of Stages for Cooling and Fan Control. Make checkbox selections if the system is using an economizer or energy recovery ventilation, and enter values for associated fields as needed. Select the green 'Create Air Handler' button when complete.

Step 10: Repeat steps 6-8 to add a DOAS Air Handler

Select Dedicated Outdoor Air System as the System Type; No Cooling as the Cooling Source; and No Heating as the Heating Source. The previously entered mechanical equipment DOAS entries now appear under the Mechanical Equipment Schedule section.

Note:

Newly created HVAC Components will appear in a summary table. Values for calculated weighted average cooling and heating equipment efficiencies and total system fan power for grouped equipment appear in blue. Edit components by selecting the "Edit" icon (pencil), and/or delete entries by selecting the "trash can" icon next to the component name.

	Desig	n Supply Airflow	System Fan Pow
Name	Desig	(CFM)	(W/CFM)
RTU - 2	14000	0.0	0.425
		 Economiz Energy R 	er
ERV	Sensible	0.7	
Effectiveness:	Heating*	ERV Ecor	nomizer Bypass
		 ERV Sup Control 	oly Air Temperature
System F Reduction w	an Power /hen ERV	.2	W/CFM
В	ypassed*		
Fan	Control*	Constant	/olume
	Name*	DOAS - NH	I/NC
Sys	Name* tem Type	DOAS - NH Dedicated O	1/NC utdoor Air System
Sys Mechanical Ed	Name* tem Type quipment So	DOAS - NH Dedicated O	1/NC utdoor Air System 🔹
Sys Mechanical Er Enter HVAC equ equipment fequipment Existing unassis	Name* tem Type quipment So upment infor ency and sut	DOAS - NH Dedicated O chedule mation to calculate stract supply fan p	I/NC utdoor Air System • a weighted average ower for packaged plicable to this system
Sys Mechanical Er Enter HVAC equequipment effici equipment Existing unassig	Name* tem Type quipment Se aipment infor ency and sut aned mechan	DOAS - NH Dedicated O chedule mation to calculate tract supply fan p ical equipment ap Cooling	I/NC utdoor Air System • a weighted average ower for packaged plicable to this system Heating
Sys Mechanical E Enter HVAC eque equipment effici equipment Existing unassig Equipment ID	Name* tem Type quipment Se upment inform ency and sub uned mechan Quantity	DOAS - NH Dedicated O chedule mation to calculate otract supply fan p ical equipment ap Cooling Efficiency	I/NC utdoor Air System a weighted average ower for packaged plicable to this system Heating Efficiency Attach
Sys Mechanical Er Enter HVAC eque equipment effici equipment Existing unassig Equipment ID DOAS 1	Name* tem Type uipment Set uipment informency and sub uned mechan Quantity 3	DOAS - NH Dedicated O chedule mation to calculate tract supply fan p iccal equipment ap Cooling Efficiency f NA	VNC utdoor Air System • a weighted average ower for packaged plicable to this system Heating Efficiency NA Attach NA O
Sys Mechanical Er Enter HVAC eque equipment effici equipment Existing unassig Equipment ID DOAS 1 DOAS 2	Name* tem Type quipment Sto ipment informency and sut ined mechan Quantity 3 4	DOAS - NH Dedicated O chedule mation to calculate tract supply fan p ical equipment ap Cooling Efficiency NA NA	I/NC utdoor Air System a weighted average ower for packaged plicable to this system Heating Filiciency NA Attach MA Ø Attach
Sys Mechanical Er Enter HVAC eque equipment effici existing unassig Equipment ID DOAS 1 DOAS 2 Cooling Equip	Name* tem Type quipment Se upment infor ency and sut ined mechan Quantity 3 4 ment	DOAS - NH Dedicated O chedule mation to calculate otract supply fan p ical equipment ap Cooling Efficiency H NA NA	t/NC utdoor Air System a weighted average ower for packaged plicable to this system Heating Efficiency NA Attach NA Ø Ø
Sys Mechanical Er Enter HVAC eque equipment effici existing unassig Equipment ID DOAS 1 DOAS 2 Cooling Equip Cooling	Name* tem Type quipment Se upment infor ency and sub ined mechan Quantity 3 4 ment I Source*	DOAS - NH Dedicated O chedule mation to calculate otract supply fan p ical equipment ap Cooling Efficiency H NA NA NA	t/NC utdoor Air Syster a weighted average ower for packaged plicable to this system Heating Efficiency Attach NA NA A Attach NA A A A A A A A A A A A A A
Sys Mechanical Ed Enter HVAC equipment effici equipment effici equipment ID DOAS 1 DOAS 2 Cooling Equip Cooling Heating Equip	Name* tem Type quipment Se upment infor ency and sut ined mechan Quantity 3 4 ment y Source*	DOAS - NH Dedicated O chedule mation to calculate tract supply fan p ical equipment ap Cooling Efficiency NA NA NA	I/NC utdoor Air System • a weighted average ower for packaged plicable to this system Heating Ifficiency NA NA Attach NA A Attach NA A Attach
Sys Mechanical Er Enter HVAC eque equipment effici equipment Existing unassig Equipment ID DOAS 1 DOAS 2 Cooling Equip Cooling Heating Equip	Name* tem Type quipment Sta ipment informency and sut ined mechan Quantity 3 4 ment y Source*	DOAS - NH Dedicated O chedule mation to calculate tract supply fan p ical equipment ap Cooling Efficiency NA NA	t/NC utdoor Air System e weighted average ower for packaged plicable to this system Heating NA NA NA NA NA NA NA NA NA NA

			M	echanical Equip	ment Schedu	ule: Air Handle	rs			
Equipment ID	Quantity	Rated Capacity	Rated Efficiency	Calculated Efficiency	Rated Capacity	Rated Efficiency	Calculated Efficiency	Design Supply Airflow	Total Fan Power	Calculated Fan Power
Air Handler 1 - Pl	gd Heat Pump ,	 								
			Cooling - Central D>	<		Heating - Heat Pum)		Fan System	
RTU - 2	12	36000.0 Btu/h	14.0 SEER	3.8 COP	38000.0 Btu/h	7.9 HSPF	3.8 COP	14000.0 CFM	0.425 W/CFM	0.425 W/CFM
DOAS (NH/NC) - I	Dedicated Outdo	oor Air System 🖌	`							
			Cooling - No Cooling	9		Heating - No Heating	9		Fan System	
DOAS 1	3							5000.0 CFM	0.819 W/CFM	0.808 W/CEM
DOAS 2	4							2500.0 CFM	0.792 W/CFM	0.000 W/C/ W





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Input Option #2: Enter equipment directly within HVAC component input screens

Step 1: Create Air Handler HVAC Component entry

Select the green 'Add' button below the HVAC equipment summary table from the Mechanical Equipment screen:



Select the '+' (Add) icon from the Air Handlers sidebar option on the Heating and Cooling screen

TSPR ME Example	\frown		Q	I	l	* *	ø°	•
AIR HANDLERS	Ð							

Step 2: Assign name, select System Type, Cooling Source, and Heating Source

Select Pkgd Heat Pump as the System Type; Central DX as the Cooling Source; and Heat Pump as the Heating Source. Note that the Fuel Type is auto set to Electricity, the Condenser Type is auto set to Air, and previously entered mechanical equipment entries now appear under the Mechanical Equipment Schedule section.

Step 3: Create Mechanical Equipment Schedule entries

Scroll back to the top of the screen and enter a descriptive name and number of pieces of equipment for a new equipment entry. Select the blue 'Add Equipment' button to add additional entries. Scroll down to the Cooling and Heating Equipment sections and enter rated capacity and efficiency values for each equipment entry.

ipment Schedule			Heating Equ	ulpment			Fan Systems		
ment information to cal cy and subtract supply	culate weighted fan power for pa	average ackaged	11	and the second second			Name	Design Supply Airflow (CFM)	System Fan Power (W/CFM)
			Heat	ing source	Heat Pump	•	RTU 1	12000	.350
ed mechanical equipme	nt applicable to	this system:		and a second	21 2322		RTU 2	14000	.425
Cooling	Heating			Fuel Type*	Electricity	•		G Engenin	
quipment ID Quantity Efficiency Efficiency Attach							Econom₂	ei .	
nent assigned to this s	stem		Conde	enser Type*	Air	*		🗐 Energy R	ecovery Ventilation
Quantity	Opt	ions		Rated Capacity			Fan	Fan Control* Constant Volu	
8	1		Name	(Btu/h)	Efficiency Units	Rated Efficiency			
12	t		RTU 1	42000	COP .	4.3			
			RTU 2	38000	HSPF .	7.9		Cance	Create Air hand
il) n c r	prment Schedule nent information to cali y and subtract supply d mechanical equipme Cooling Quantity Efficiency nent assigned to this sy Quantity 8 12	prenet Schedule nent information to calculate weighted y and subtract supply fan power for po d mechanical equipment applicable to Quantity Cooling Heating Efficiency Efficiency nent assigned to this system: Quantity Opt 8 12	pment Schedule nent information to calculate weighted average y and subtract supply fan power for packaged d mechanical equipment applicable to this system: Quantity Cooling Heating Attach Pent assigned to this system: Quantity Options 8 12	pment Schedule Heating Equ nent information to calculate weighted average y and subtract supply fan power for packaged Heating Equ d mechanical equipment applicable to this system: Heating Quantity Cooling Heating 2uantity Efficiency Attach Quantity Options Name 12 Image: Calculate of the system Name	Image: Schedule Heating Equipment nent information to calculate weighted average sy and subtract supply fan power for packaged Heating Source* d mechanical equipment applicable to this system: Fuel Type* Quantity Cooling Heating Efficiency Efficiency Attach Yent assigned to this system: Condenser Type* Quantity Options Rated Capacity 8 (Blu/h) 12 Xame RTU 1 42000 RTU 2 38000	Image: Schedule Heating Equipment nent information to calculate weighted average sy and subtract supply fan power for packaged Heating Source* d mechanical equipment applicable to this system: Fuel Type* 2uantity Cooling Heating Heating Source* Manuality Efficiency Quantity Options 8 (Blu/h) 12 Image: Source RTU 1 42000 COP RTU 2	pment Schedule nent information to calculate weighted average ty and subtract supply fan power for packaged d mechanical equipment applicable to this system: Quantity Cooling Efficiency Heating Efficiency Attach Quantity Options 8 Image: Cooling 12 Image: Cooling 12 Image: Cooling RTU 1 42000 COP 4.3 RTU 2 38000	Image: Schedule Heating Equipment nent information to calculate weighted average y and subtract supply fan power for packaged Heating Source* Heating Source* Heat Pump d mechanical equipment applicable to this system: Fuel Type* Cooling Heating Efficiency Heating Cooling Heating Auantity Cooling Quantity Options 8 Image: Cooling 12 Image: Cooling RTU 1 42000 COP + 4.3 RTU 2 38000	Image: Solution is system: Heating Equipment Heating Source* Heating Pump Heating Source* Heating Source* Heating Source* Heating Pump Image: Solution is system: Image: Solution is system: Image: Solution is s

Step 4: Complete any remaining HVAC component required inputs and save

Select an appropriate option for Number of Stages for Cooling and Fan Control. Make checkbox selections if the system is using an economizer or energy recovery ventilation, and enter values for associated fields as needed. Select the green 'Create Air Handler' button when complete.

Step 5: Repeat steps 1-4 to add a DOAS Air Handler

Select Dedicated Outdoor Air System as the System Type; No Cooling as the Cooling Source; and No Heating as the Heating Source. Scroll back to the top of the screen to create DOAS equipment entries.

