General Characteristics		
1	**Abstract of Model Capabilities**	VENTSAR XL is a dose assessment model used at the Savannah River Site to calculate dose following short-term atmospheric releases. Building effects and plume rise may be considered. VENTSAR XL has been programmed through the use of MACROS, the programming language for Microsoft Excel and is capable of running on either any computer which supports Microsoft 4.0 or later. Doses (and concentrations) are calculated for up to 200 user-selected increments. Plume shine and inhalation dose pathways are available.
2	**Sponsor and/or Developing Organization**	Ali A. Simpkins Westinghouse Savannah River Company 773-A rm A1001 Aiken, SC 29808 (803)725-9643 **Fax** (803)725-4233 ali.simpkins@srs.gov **sponsoring organization** ali.simpkins@srs.gov **developing organization**
3	**Last Custodian/ Point of Contact**	Ali A. Simpkins Westinghouse Savannah River Company 773-A rm A1001 Aiken, SC 29808 (803)725-9643 **Fax** (803)725-4233 ali.simpkins@srs.gov **primary individual** tim.jannik@srs.gov dxw@inel.gov **secondary individual**
4	**Life-Cycle**	VENTSAR XL originated as VENTX at SRS. Concentrations were calculated given a release on or near a building. VENTX was improved in 1983 and changed to VENTSAR and resided on the IBM Mainframe. VENTSAR was moved to spreadsheet. In 1996 and the dose calculation model was added in 1997. A copyright has been filed.
5	**Model Description Summary**	VENTSAR XL is a straight-line Gaussian Plume model with building effects and plume rise options. The building can be a simple structure or a penthouse can be added to the top of the building. Recirculation cavities and high turbulence zones are considered as well as wakes beyond the building. Plume rise due to buoyancy and momentum can be considered. Downwash is also considered as necessary. Buoyancy is determined using Briggs methodology by calculating an initial buoyancy flux. Briggs methodology is also used for momentum effects using the initial vertical velocity of the effluent. Doses are calculated at user-specified increments. Effective dose equivalents are calculated for plume shine and inhalation exposure pathways. Daughter ingrowth is not considered
6	**Application Limitation**	VENTSAR XL does not consider daughter ingrowth, but the user may adjust the source term as appropriate. Only plume shine and inhalation exposure pathways are considered.
7	**Strengths/ Limitations**	**Strengths:** The program is very user friendly and the user-input template is easy to follow. Output is easily converted to graphs. **Limitations:** Daughter ingrowth is not considered**.**
8	**Model References**	! Simpkins, A.A. 1997, VENTSAR XL - A Spreadsheet for Analyzing Building Effects and Plume Rise, WSRC-RP-97-37, Westinghouse Savannah River Company, Aiken, SC. ! Simpkins, A.A. 1996, Verification of VENTSAR XL - A Spreadsheet Version of VENTSAR(U), WSRC-RP-96-228, Westinghouse Savannah River Company, Aiken, SC. ! Briggs, G.A. , 1969: Plume Rise, Air Resources Atmospheric Turbulence and Diffusion Laboratory, TID-25075, USAEC, Division of Technical Information. ! Wilson, D.J., 1979: "Flow Patterns Over Flat-Roofed Buildings and Application to Exhaust Stack Design", ASHRAE Transactions 85, Part 2, p 284. ! Hosker, R.P., 1984: "Flow and Diffusion Near Obstacles", Atmospheric Science and Power Production, DOE/TIC-27601, p 241.
9	**Input Data/Parameter Requirements**	The following items are needed for input: location of the release, building dimensions, distance to building, sector, release height, exceedance probability or set of meteorological conditions, vent diameter, gas molecular weight, vent gas temperature, ambient air temperature, breathing rate, radio nuclides and amount released.
10	**Output Summary**	Tabular output showing concentrations and pathway doses (if selected) for each of the incremental downwind distances. Annual average concentrations are also shown if the exceedance probability was selected.
11	**Applications**	VENTSAR has been used at the Savannah River Site to analyze building effects such as the K Reactor Cooling Tower in support of the Safety Analysis for the restart of K Reactor.

12	**User-Friendliness**	VENTSAR XL is extremely user-friendly and the code can be executed by clicking on a button. A variety of checks have been added to the program to prevent the user from entering incorrect input.
13	**Hardware-Software Interface Constraints/ Requirements**	**Computer operating system:** VENTSAR XL will operate on any platform that supports Microsoft Excel version 4.0 or greater. **Computer platform:** Macintosh or IBM. **Disk space requirements:** VENTSAR XL and the necessary related files take just over 1 megabyte of space. The program can be executed directly from the disk. **Run execution time** (for a typical problem)**:** Depends on speed of computer and number of increments. Anywhere from seconds to 15 minutes for a slower machine. **Programming language:** MACROS by Microsoft Excel **Other computer peripheral information:** No information provided.
14	**Operational Parameters**	**Identify whether the code has any error diagnostic messages to assist the user in troubleshooting operational problems:** The code will not execute if improper input was entered and the user will receive a message showing which input is invalid**.** **Set up time for: Typical times are: *first-time user:*** hours ***experienced user:*** minutes
15	**Surety Considerations**	**All quality assurance documentation:** Verification Report listed above Simpkins, A.A. Software Quality Assurance Plan for Environmental Dosimetry, Westinghouse Savannah River Company Report, WSRC-RP-95-1159, Aiken, SC, November, 1994. **Benchmark runs:** Runs are maintained by the Environmental Dosimetry Group and SRS. When any time changes to code are made, test cases are performed.. **Validation calculations:** Reports cited above. **Verification with field experiments that has been performed with respect to this code:**
16	**Runtime Characteristics**	Seconds to minutes depending on the speed of the machine. For an up-to-date Macintosh, a detailed problem will execute in about 5 minutes.

Specific Characteristics

Part A: Source Term Submodel Type

A1	**Source Term Algorithm?**	_✔_YES __NO

Part B: Dispersion Submodel Type

B1	**Gaussian**	**_✔_Straight-line plume __Segmented plume __ Statistical plume __ Statistical puff**

Part C: Transport Submodel Type

C1	**Prognostic**	No prognostic capability
C4	**Frame of Reference**	**_✔_ Eulerian __ Lagrangian __ Hybrid __ Eulerian-Lagrangian**

Part D: Fire Submodel Type (Not Applicable)

Part E: Energetic Events Submodel Type (Not Applicable)

Part F: Health Consequence Submodel Type

F1	**For Chemical Consequence Assessment Models**	**Health effects: __ fatalities __ cancers __ latent cancers __ symptom onset** **Health criteria** **__ IDLH __ STEL __ TLV __ TWA** **__ ERPG __ TEEL __ AEGL __ WHO** **Zones with flammable limits: __ UFL __ LFL** **Blast overpressure regions:** **Fire radiant energy zones:** **Risk qualification:** **Concentration: _✔_ single value __ time-history __ integrated dose** **Probits:**

F2	**For Radiological Consequence Assessment Models**	**Cloudshine:** ___ finite cloud _✔_ semi-finite cloud ___ other **Groundshine:** ___ short-term ___ long-term **Inhalation:** _✔_ short-term ___ long-term _✔_ Total effective dose equivalent ___ Uptake of respirable fraction of particle spectra **Resuspension:** __ short-term __ long-term __ Anspaugh **Food/Water Ingestion:** __ dynamic __ static **Skin dose:** _✔_ absorption __ other **Dose assessment:** __ ICRP-60 criteria __ organs _✔_ pathways **Health effects:** __ early __ latent
F3	**For Weapons Consequence Assessment Models**	**Health effects:** __ fatalities __ cancers __ latent cancers__ symptom onset **Health criteria** __ IDLH __ STEL __ TLV __ TWA __ ERPG __ TEEL __ AEGL **Risk quantification:** **Concentration:** _✔_ single value __ time-history _✔_ integrated dose **Probits:**
Part G: Effects and Countermeasures Submodel Type		
G1	**For Chemical Consequence Assessment Models**	**Evacuation:** N/A **Sheltering:** N/A **Interdiction:** **Spray/Foam:** **Victim Treatment/Treatment Measures:**
Part H: Physical Features of Model		
H2	**Release Elevation**	_✔_ ground _✔_ roof
H3	**Aerodynamic Effects from Buildings and Obstacles**	_✔_ building wake _✔_ cavity __ K-factors __ flow separation
H11	**Resuspension**	None
H12	**Radionuclide Ingrowth and Decay**	Yes
Part I: Model Input Requirements		
I1	**Radio(chemical) and Weapon Release Parameters**	**Release rate:** _✔_ Continuous __ Time dependent ___ Instantaneous **Release container characteristics:** __ vapor temperature __ tank diameter __ tank height __ tank temperature __ tank pressure __ nozzle diameter __ pipe length **Jet release:** _ initial size __ shape __ concentration profile at end of jet affected zone **Release dimensions:** _✔_ point ___ line ___ area **Release elevation:** _✔_ ground _✔_ roof _✔_ stack
I2	**Meteorological Parameters**	**Wind speed and wind direction:** _✔_single point __ single tower/multiple point ___ multiple towers **Temperature:** ___ single point __ single tower/multiple point ___ multiple towers **Dew point temperature:** ___ single point __ single tower/multiple point __ multiple towers **Precipitation:** __ single point __ single tower/multiple point ___ multiple towers **Turbulence typing parameters:** __ temperature difference _✔_ sigma theta _✔_ sigma phi __ Monin-Obukhov length __ roughness length ___ cloud cover __ incoming solar radiation __ user-specified **Four dimensional meteorological fields from prognostic model:**
Part J: Model Output Capabilities (See Item 10.)		
Part K: Model Usage Considerations		

K1	**Ease of Model Use**	**Training required to run the model: _3_ background (years of education)** _3_ **training time needed on the model to be able to exercise all model capabilities** **Training required to continue development of the model:** _4_ **background (years of education)** _6_ **training time needed on the model to be able to exercise all model capabilities**
K2	**Time to Process From Notification of Release (including data acquisition) to Production of Product Listed in #K1, Listed for Platforms for Which the Program is Already Compiled**	10-15 minutes
K3	**Ease of Use of Output, Evaluated as the Time Needed to Train a College Graduate in the Use of the Output**	2 days