```
!     btf.des
!     Design paramters and boundary condition data
!     for the HOLTEC HISTAR 100 MPC-24
!
! Required macros and files:
!     btf.inp     - main input deck (calls this file)
!     boral.mac   - boral gap radiation/conduction macro
!     fuel.mac    - fuel conductivity macro
!
!   Units: BTU, in, hour, F, lbm
!
!
!
/title,Baltimore Tunnel Fire Analysis w/Holtec Hi-Star Cask 10/31/02
case='btf'                          !  Id for this run, appears at the top
                                    !  of each plot

!-------------------------------------------------------------------------
------
! Update these values iteratively with file "convection.xls"
!tshell=342.42                       !  temperature at mpc shell
                                    !  (from HI-STORM 100 thermal analysis
                                    results)
tshell=332                          ! temperature at mpc shell
                                    ! (from HI-STAR 100 FSAR long term results)
!Tgas=462                           ! average canister cover gas temperature
Tgas=300                            ! average canister cover gas temperature
Tgas2=300                           ! average overpack cover gas temperature

!-------------------------------------------------------------------------
------
fti=12                              !  conversion factor ft to inch
pi=3.14159265                       !  pi
gr_in=386.4                         !  gravity term
hts=3600                            !  conversion factor from hours to seconds
!
! Basket geometry parameters
!
celptch=10.777                      !  basket cell pitch
fuelwid=8.43                        !  W17x17-OFA fuel assembly width
gtube_i=8.75                        !  inner width of guide tube
fuelgap=(gtube_i-fuelwid)/2         !  gap between guide tube and fuel
lfuel=144                           !  active fuel length (in)
tk1=5/16                            !  thickness of basket plate
tk1a=9/32                           !  thickness of basket plate
tk2=5/16                            !  thickness of basket supports
tk3=0.06                            !  thickness of boral sheathing
wd3=7+11/16                         !  width of boral sheathing (wide)
wd6=6+7/16                          !  width of boral sheathing (narrow)
tk4=0.075                           !  thickness of boral plate
wd4=7.5                             !  width of boral plate (wide)
wd5=6.25                            !  width of boral plate (narrow)
wd34=(wd3-wd4)/4                    !  gap between boral & sheathing @ ends
- assumed -
gp1=(0.082-tk4)/2                   !  gap between boral & sheathing/basket
plate
tclad=0.25*tk4/2                    !  thk of boral clad
- assumed -
tcore=0.75*tk4                      !  thk of boral core
- assumed -
!
! MPC geometry parameters
!
rinner=33.6875                      !  mpc shell inner radius
router=34.1875                      !  mpc shell outer radius
thkshl=.5                           !  thickness of the mpc shell
cutbac=.15                          !  basket support leg cut-back to rep. 1/8"
fillet weld  - assumed -
```

```
wd2=rinner-61.78/2                  ! basket support 9B stand-off distance
bsratio=.3                          ! ratio of basket support stand-off
between 9C/9A        - assumed -
wd2_9A=wd2*2*(1-bsratio)            ! basket support 9C stand-off distance
- assumed -
wd2_9C=wd2*2*bsratio                ! basket support 9A stand-off distance
- assumed -
ang2=16                             ! basket support 9A/9B/9C angle
- assumed -
bri=0.4                             ! basket support 9A/9B/9C inner radius
- assumed -
bro=bri+tk2                         ! basket support 9A/9B/9C outer radius
- assumed -
ang_9B_1=317                        ! basket support 9B angle (REF 315?)
- assumed -
ang_9B_2=133                        ! basket support 9B angle (REF 135?)
- assumed -
ang_9A=225                          ! basket support 9A angle
ang_9C=45                           ! basket support 9C angle
wd7=rinner-64.20/2                  ! basket support 5C stand-off distance
wd8=3                               ! basket support 5C width
ang_5C_1=0                          ! basket support 5C angle
ang_5C_2=90                         ! basket support 5C angle
ang_5C_3=180                        ! basket support 5C angle
ang_5C_4=270                        ! basket support 5C angle
wd9=rinner-32.68                    ! basket support 5E stand-off distance
wd10=2.5                            ! basket support 5E width
ang_5E_1=21                         ! basket support 5E angle
- assumed -
ang_5E_2=69                         ! basket support 5E angle
- assumed -
ang_5E_3=159                        ! basket support 5E angle
- assumed -
ang_5E_4=291                        ! basket support 5E angle
- assumed -
wd11=rinner-33.354                  ! basket support 5D stand-off distance
wd12=2.5                            ! basket support 5D width
ang_5D_1=108                        ! basket support 5D angle
- assumed -
ang_5D_2=198                        ! basket support 5D angle
- assumed -
ang_5D_3=252                        ! basket support 5D angle
- assumed -
ang_5D_4=342                        ! basket support 5D angle
- assumed -
!
! Overpack geometry parameters
!
ri_opack=68.75/2                    ! overpack inner radius
shtki=2.5                           ! overpack inner shell thickness
ish1=1.25                           ! overpack intermediate shell 1 thickness
ish2=1.25                           ! overpack intermediate shell 2 thickness
ish3=1.25                           ! overpack intermediate shell 3 thickness
ish4=1.25                           ! overpack intermediate shell 4 thickness
ish5=1                              ! overpack intermediate shell 5 thickness
ishtk=ish1+ish2+ish3+ish4+ish5      ! thickness of gamma shield plates
cutbac2=.15                         ! channel leg cut-back to rep. 1/4" fillet
weld           - assumed -
rsho=ri_opack+shtki+ishtk           ! outer radius of overpack plates
rchtk=0.5                           ! plate thickness of radial channels
eshtk=0.5                           ! enclosure shell thickness
eshleng=8                           ! enclosure shell length
rchdp=4+7/16                        ! inside depth of radial channels
rchbri=1                            ! inside bend radius of radial channel
- assumed -
rchbro=rchbri+rchtk                 ! outside bend radius of radial channel
- assumed -
numch=20                            ! number of radial channels
```

```
fmtk=0.125                          ! thickness of thermal expansion foam
(HT-870)          - assumed -
ro_opack=96/2                       ! overpack outer radius
!
! Fuel heat generation parameters
!
heatld=20                           !  max. heat load (kW)
numfuel=24                          !  max. number of fuel assemblies
qpeak=1.1                           !  peaking factor for the fuel
qtot=heatld*3413                    !  total heat load   (btu/hr)
arfuel=numfuel*fuelwid*fuelwid      !  total area of fuel region (in**2)
qfuel=qpeak*qtot/(lfuel*arfuel)     !  heat generation for the fuel (btu/hr-
in**3)
!
! Basket radiation parameters
!
sbc=(.119e-10)                       !  SB radiation constant (btu, in, F)
formf=1                              !  form (view) factor
esstl=0.36                           !  emissivity of the basket internals
(FSAR: 0.36)
ebor=0.55                            !  emissivity of boral plate (Aluminum
Clad)
est12=0.36                           !  emissivity of the shell interior
efuel=0.8                            !  emissivity of zircaloy clad fuel
(FSAR: 0.8)
ecarb=0.66
emis_b=1/(1/esstl+1/ebor-1)          !  effective emissivity of sst/boral
!
! Helium conduction parameters
!
zc=1                                 ! mult for Helium conduction due to
velocity
fk=0.957                             ! 1% rod failure
fill_p=28.3                          ! initial MPC He fill pressure (gauge)
fill_t=70                            ! temperature at MPC fill (F)
p_atm=14.696                         ! atmospheric pressure (gauge)
fill_d=4.00260*p_atm*fti**2/1545.3/(Tgas+460)
                                     ! initial density of MPC fill (lbm/ft^3)
gtmult=((Tgas+460)*(fill_p+p_atm)/(fill_t+460))/p_atm
                                     !  MPC pressurization in atmospheres
fk=fk+gtmult-1                       !  multiplier for Helium conduction due
to enhanced
                                     !  pressurization in remaining canister
                                    region
                                     !  (accounts for fission gas too)

fillo_p=10                           ! initial overpack He fill pressure
(gauge)
fillo_t=70                           ! temperature at overpack fill (F)
p_atm=14.696                         ! atmospheric pressure (gauge)
fill_d=4.00260*p_atm*fti**2/1545.3/(Tgas2+460)
                                     ! initial density of overpack fill
                                     (lbm/ft^3)
gtmult2=((Tgas2+460)*(fillo_p+p_atm)/(fillo_t+460))/p_atm
                                     !  overpack pressurization in atmospheres
fk2=gtmult2-1                        !  multiplier for Helium conduction due
to enhanced
                                     !  pressurization in overpack region
!
! Transient loading parameters
!
! insolation parameters
abso_sol=0.90                          ! asorptivity of overparck surface
coating (HEA)
thik_sol=0.1                           ! thickness of solar layer
solm=1.00                              ! solar insolation correction
multiplier
rate_sol=solm*(1475/144)/24*abso_sol ! surface heat rate to simulate solar
```

```
(Btu/in^2)
! ambient parameters
temp_amb=100                          ! ambient temperature
film_amb=0.891/fti**2                 ! film coefficient for convection to
ambient
emis_amb=0.85                         ! emissivity for radiation to ambient
(FSAR: 0.85)
view_amb=1                            ! radiation view factor for radiation
to ambient
! fire parameters
time_fir=7                            ! time of fire (s)
temp_fir=1500                         ! fire temperature
film_fir=2.5/fti**2                   ! film coefficient for convection
during fire
emis_fir=0.9                          ! emissivity for fire
view_fir=1                            ! radiation view factor for fire
! cooldown to ambient properties
time_am2=100                          ! time for cooldown after fire (s)
temp_am2=100                          ! ambient temperature
film_am2=0.891/fti**2                 ! film coefficient for convection to
ambient after fire
emis_am2=0.9                          ! emissivity for ambient after fire
view_am2=1                            ! radiation view factor for ambient
after fire
!
! -Z-Axis locations for extrusion
!
  zl_tot=22
  *dim,zl,array,zl_tot,,,ict,,,
  *set,zl(1),0.,6.,6.44,8.75,19.75,34.15,48.55,62.95,77.35,91.75

  *set,zl(11),106.15,120.55,134.95,149.35,163.75,173.125,181.875,185.25,187.
  25,196.75
  *set,zl(21),197.125,203.125
!
! Material properties
!
fini
/prep7

!-------------------------------------------------------------------------
----
!     material 1  = Fuel region
!     material 2  = Stainless steel for basket plates
!     material 3  = Stainless steel for basket supports
!     material 4  = Stainless steel for boral plate sheathing
!     material 5  = Helium - gas conduction in central core region
!     material 6  = Helium - gas conduction between MPC and cask
!
!     material 7  = Helium - gas conduction in region between guide tubes &
basket plates
!     material 8  = Helium - gas conduction in region between basket & MPC
shell
!     material 9  = Boral plates (parallel to thickness)
!     material 10 = Boral plates (parallel to cross-width)
!     material 11 = Stainless steel for MPC shell
!
!     material 17 = Reduced 5/16" radial basket support conductivity (1/8"
fillet weld)
!     material 18 = Reduced 3" radial basket support conductivity (1/8"
fillet weld)
!     material 19 = Reduced 2.5" radial basket support conductivity (1/8"
fillet weld)
!
!     material 20 = Stainless steel for inner shell of overpack
!     material 21 = Carbon steel for intermediate shells of overpack (with
gaps)
!     material 22 = Stainless steel for radial channels of overpack
```

```
!     material 23 = Stainless steel for enclosure shells of overpack
!     material 24 = Holtite A for neutron shield
!     material 25 = HT-870 for foam
!     material 26 = Air for degraded Holtite A after fire
!     material 27 = Reduced radial channel conductivity (1/4" fillet weld)
!     material 28 = Carbon steel for intermediate shells of overpack
(intimate contact)
!
!     material 31 = emissivity of fuel based on value for zircaloy
!     material 32 = emissivity of basket based on value for Alloy X
!     material 42 = emissivity of support bracket based on value for Alloy X
!     material 52 = emissivity of MPC wall based on value for Alloy X
!
!     material 60 = Carbon steel for impact limiter base structure
!     material 61 = Air void in impact limiter
!     material 62 = Type 1 Aluminum Honeycomb
!     material 63 = Type 2 Aluminum Honeycomb
!     material 64 = Type 3 Aluminum Honeycomb
!     material 65 = Type 4 Aluminum Honeycomb
!     material 66 = Neutron Shield (Holtite A) in impact limiter
!
!     material 999= dummy material number to give ANSYS the capability of
using higher numbers

!-------------------------------------------------------------------------
----
!  Fuel Region
fuel,1,fk

!-------------------------------------------------------------------------
----
!  Stainless steel for Basket (Alloy X)
!  FSAR: 501 lbm/ft^3, 0.12 Btu/lbm-F, 200,450,700/8.4,9.8,11.0 F Btu/ft-hr-
F
mptemp
mptemp,1,200,450,700
mpdata,kxx,2,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,2,501/fti**3
mp,c,2,0.12
!  Stainless steel for basket supports (Alloy X)
mptemp
mptemp,1,200,450,700
mpdata,kxx,3,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,3,501/fti**3
mp,c,3,0.12
!  Stainless steel for boral plate sheathing (Alloy X)
mptemp
mptemp,1,200,450,700
mpdata,kxx,4,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,4,501/fti**3
mp,c,4,0.12
!  Stainless steel for MPC shell (Alloy X)
mptemp
mptemp,1,200,450,700
mpdata,kxx,11,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,11,501/fti**3
mp,c,11,0.12
!  Stainless steel for basket supports (Alloy X)
!  reduced radial-direction basket support conductivity (1/8" fillet weld)
mptemp
mptemp,1,200,450,700
mpdata,kxx,17,1,8.4/fti*.4,9.8/fti*.4,11.0/fti*.4
mpdata,kyy,17,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,17,501/fti**3
mp,c,17,0.12
!  Stainless steel for basket supports (Alloy X)
!  reduced radial-direction basket support conductivity (1/8" fillet weld)
mptemp
```

```
mptemp,1,200,450,700
mpdata,kxx,18,1,8.4/fti*0.0833,9.8/fti*0.0833,11.0/fti*0.0833
mpdata,kyy,18,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,18,501/fti**3
mp,c,18,0.12
!  Stainless steel for basket supports (Alloy X)
!  reduced radial-direction basket support conductivity (1/8" fillet weld)
mptemp
mptemp,1,200,450,700
mpdata,kxx,19,1,8.4/fti*0.1,9.8/fti*0.1,11.0/fti*0.1
mpdata,kyy,19,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,19,501/fti**3
mp,c,19,0.12
!  Stainless steel for inner shell of overpack (Alloy X)
mptemp
mptemp,1,200,450,700
mpdata,kxx,20,1,8.4/fti,9.8/fti,11.0/fti
mp,dens,20,501/fti**3
mp,c,20,0.12

!-------------------------------------------------------------------------
----
!  Helium - gas conduction in central core region
!  density calculated at standard pressure using ideal gas law and then
scaled
!  for an average pressure using the zc*fk factor
!  FSAR: 1.24 Btu/lbm-F 200,450,700/0.0976,0.1289,0.1575 F Btu/ft-hr-F
den_h000=(4.00260*p_atm*fti**2/1545.3/(0+460))/(fti**3)
den_h200=(4.00260*p_atm*fti**2/1545.3/(200+460))/(fti**3)
den_h400=(4.00260*p_atm*fti**2/1545.3/(400+460))/(fti**3)
den_h600=(4.00260*p_atm*fti**2/1545.3/(600+460))/(fti**3)
den_h800=(4.00260*p_atm*fti**2/1545.3/(800+460))/(fti**3)
mptemp
mptemp,1,0,200,400,600,800

mpdata,kxx,5,1,0.0065*zc*fk,0.00808*zc*fk,0.00958*zc*fk,0.01075*zc*fk,0.0115
*zc*fk
mpdata,dens,5,1,den_h000,den_h200,den_h400,den_h600,den_h800
mp,c,5,1.24
!   Helium - gas conduction between MPC and cask
mptemp
mptemp,1,0,200,400,600,800
mpdata,kxx,6,1,0.0065*fk2,0.00808*fk2,0.00958*fk2,0.01075*fk2,0.0115*fk2
mpdata,dens,6,1,den_h000,den_h200,den_h400,den_h600,den_h800
mp,c,6,1.24
!   Helium - gas conduction in region between guide tubes & basket
mptemp
mptemp,1,0,200,400,600,800

mpdata,kxx,7,1,0.0065*zc*fk,0.00808*zc*fk,0.00958*zc*fk,0.01075*zc*fk,0.0115
*zc*fk
mpdata,dens,7,1,den_h000,den_h200,den_h400,den_h600,den_h800
mp,c,7,1.24
!   Helium - gas conduction in region between basket & MPC shell
mptemp
mptemp,1,0,200,400,600,800

mpdata,kxx,8,1,0.0065*zc*fk,0.00808*zc*fk,0.00958*zc*fk,0.01075*zc*fk,0.0115
*zc*fk
mpdata,dens,8,1,den_h000,den_h200,den_h400,den_h600,den_h800
mp,c,8,1.24

!-------------------------------------------------------------------------
----
!   data for helium conductivity (btu/hr-in-F)
!   to be used in boral.mac
*set,kxxx
*dim,kxxx,table,5
```

```
kxxx(1,0)=0,200,400,600,800
kxxx(1,1)=
0.0065*zc*fk,0.00808*zc*fk,0.00958*zc*fk,0.01075*zc*fk,0.0115*zc*fk
!
!  boral plates (parallel to thickness)
boral,9,emis_b*formf*sbc,gp1,tclad,tcore,1
!
!  boral plates (parallel to cross-width)
boral,10,emis_b*formf*sbc,gp1,tclad,tcore,2

!-------------------------------------------------------------------------
----
!  Carbon steel for intermediate overpack shells (with gaps)
!  FSAR: 489 lbm/ft^3, 0.1 Btu/lbm-f 200,450,700/24.4,23.9,22.4 F Btu/ft-hr-
F
!  Carbon FSAR: 200,450,700/24.4,23.9,22.4  F Btu/ft-hr-F
gam_gap=0.010
gam_form=1
gam_emis=ecarb
kgam200=(ishtk+5*gam_gap)/(ishtk/(24.4/fti)
+5*gam_gap/(gam_gap*4*gam_emis*gam_form*sbc*(200+460)**3+0.0178/fti))
kgam450=(ishtk+5*gam_gap)/(ishtk/(23.9/fti)
+5*gam_gap/(gam_gap*4*gam_emis*gam_form*sbc*(450+460)**3+0.0225/fti))
kgam700=(ishtk+5*gam_gap)/(ishtk/(22.4/fti)
+5*gam_gap/(gam_gap*4*gam_emis*gam_form*sbc*(700+460)**3+0.0272/fti))
mptemp
mptemp,1,200,450,700
mpdata,kxx,21,1,kgam200,kgam450,kgam700
mpdata,kyy,21,1,24.4/fti,23.9/fti,22.4/fti
mp,dens,21,489/fti**3
mp,c,21,0.1
!  Carbon steel for intermediate overpack shells (intimate contact)
mptemp
mptemp,1,200,450,700
mpdata,kxx,28,1,24.4/fti,23.9/fti,22.4/fti
mp,dens,28,489/fti**3
mp,c,28,0.1
!  Carbon steel for radial channels of overpack
mptemp
mptemp,1,200,450,700
mpdata,kxx,22,1,29.2/fti,27.1/fti,24.6/fti
mp,dens,22,489/fti**3
mp,c,22,0.1
!  Carbon steel for enclosure shells of overpack
mptemp
mptemp,1,200,450,700
mpdata,kxx,23,1,29.2/fti,27.1/fti,24.6/fti
mp,dens,23,489/fti**3
mp,c,23,0.1
!  Carbon steel for channels
!  reduced radial-direction basket support conductivity (1/4" fillet weld)
mptemp
mptemp,1,200,450,700
mpdata,kxx,27,1,29.2*0.5/fti,27.1*0.5/fti,24.6*0.5/fti
mpdata,kyy,27,1,29.2/fti,27.1/fti,24.6/fti
mp,dens,27,489/fti**3
mp,c,27,0.1

!-------------------------------------------------------------------------
----
!  Neutron Shield (Holtite A)
!  FSAR: 105.0 lbm/ft^3, 0.39 Btu/lbm-F 200,450,700/0.373,0.373,0.373 F
Btu/ft-hr-F
mp,kxx,24,0.373/fti
mp,dens,24,105/fti**3
mp,c,24,0.39

!-------------------------------------------------------------------------
```

```
----
!  Thermal expansion foam (BISCO HT-870)
!  Rogers Corp web: 15 lb/ft^3, 0.49 BTU in/hr/ft^2/F
mp,kxx,25,0.49/fti**2
mp,dens,25,15/fti**3
mp,c,25,0.39

!-----------------------------------------------------------------------
----
!  Air
!  FSAR: 200,450,700/0.0173,0.0225,0.0272 F Btu/ft-hr-F
!  Guyer: 200,450,700/0.0602,(0.0462+0.0413)/2,(0.0374+0.0315)/2 lbm/ft^3
!  Guyer: 200,450,700/0.2411,(0.2448+0.2473)/2,(0.2504+0.2567)/2 Btu/lbm-F
!  Guyer: 200,450,700/0.0178,(0.02200+0.02401)/2,(0.02963+0.03323)/2 F
Btu/ft-hr-F
mptemp
mptemp,1,200,450,700
mpdata,kxx,26,1,0.0178/fti,0.0225/fti,0.0272/fti
mpdata,dens,26,1,0.0602/fti**3,0.04375/fti**3,0.03445/fti**3
mpdata,c,26,1,0.2411,.24605,.25355
!
! FSAR: Cryo steel 200,450,700/23.8,23.7,22.3 F Btu/ft-hr-F
! FSAR: carbon steel support 200,450,700/29.2,27.1,24.6 F Btu/ft-hr-F
!

!-----------------------------------------------------------------------
----
!     material 60 = Carbon steel for impact limiter base structure
mptemp
mptemp,1,200,450,700
mpdata,kxx,60,1,24.4/fti,23.9/fti,22.4/fti
mp,dens,60,489/fti**3
mp,c,60,0.1

!-----------------------------------------------------------------------
----
!     material 61 = Air void in impact limiter
!  FSAR: 200,450,700/0.0173,0.0225,0.0272 F Btu/ft-hr-F
!  Guyer: 200,450,700/0.0602,(0.0462+0.0413)/2,(0.0374+0.0315)/2 lbm/ft^3
!  Guyer: 200,450,700/0.2411,(0.2448+0.2473)/2,(0.2504+0.2567)/2 Btu/lbm-F
!  Guyer: 200,450,700/0.0178,(0.02200+0.02401)/2,(0.02963+0.03323)/2 F
Btu/ft-hr-F
convmult=6.
mptemp
mptemp,1,200,450,700
mpdata,kxx,61,1,convmult*0.0178/fti,convmult*0.0225/fti,convmult*0.0272/fti
mpdata,dens,61,1,0.0602/fti**3,0.04375/fti**3,0.03445/fti**3
mpdata,c,61,1,0.2411,.24605,.25355

!-----------------------------------------------------------------------
----
!     material 62 = Type 1 Aluminum Honeycomb  -- Fix Me!
mptemp
mptemp,1,200,450,700
mpdata,kxx,62,1,0.0178/fti,0.0225/fti,0.0272/fti
mpdata,dens,62,1,0.0602/fti**3,0.04375/fti**3,0.03445/fti**3
mpdata,c,62,1,0.2411,.24605,.25355

!-----------------------------------------------------------------------
----
!     material 63 = Type 2 Aluminum Honeycomb  -- Fix Me!
mptemp
mptemp,1,200,450,700
mpdata,kxx,63,1,0.0178/fti,0.0225/fti,0.0272/fti
mpdata,dens,63,1,0.0602/fti**3,0.04375/fti**3,0.03445/fti**3
mpdata,c,63,1,0.2411,.24605,.25355

!-----------------------------------------------------------------------
```

```
----
!     material 64 = Type 3 Aluminum Honeycomb  -- Fix Me!
mptemp
mptemp,1,200,450,700
mpdata,kxx,64,1,0.0178/fti,0.0225/fti,0.0272/fti
mpdata,dens,64,1,0.0602/fti**3,0.04375/fti**3,0.03445/fti**3
mpdata,c,64,1,0.2411,.24605,.25355

!-------------------------------------------------------------------------
----
!     material 65 = Type 4 Aluminum Honeycomb  -- Fix Me!
mptemp
mptemp,1,200,450,700
mpdata,kxx,65,1,0.0178/fti,0.0225/fti,0.0272/fti
mpdata,dens,65,1,0.0602/fti**3,0.04375/fti**3,0.03445/fti**3
mpdata,c,65,1,0.2411,.24605,.25355

!-------------------------------------------------------------------------
----
!     material 66 = Neutron Shield (Holtite A) in impact limiter
!  FSAR: 105.0 lbm/ft^3,  0.39 Btu/lbm-F 200,450,700/0.373,0.373,0.373 F
Btu/ft-hr-F
mp,kxx,66,0.373/fti
mp,dens,66,105/fti**3
mp,c,66,0.39

!-------------------------------------------------------------------------
----
!  Define Aux12/Matrix50 material properties
 mp,emis,31,efuel       ! Fuel based on value for zircaloy
 mp,emis,32,esstl       ! Basket based on value for Alloy X
 mp,emis,42,est12       ! Support bracket based on value for Alloy X
 mp,emis,52,est12       ! MPC wall based on value for Alloy X
 zne1=500               ! number of zones applied to fuel/guide tube
 radiation computation
 zne2=500               ! number of zones applied to guide tube/basket
 radiation computation
 zne3=1000              ! number of zones applied to corner radiation
 computation
 zne4=500               ! number of zones applied to radiation computation
 inside supports
 zne5=500               ! number of zones applied to MPC/overpack radiation
 computation
 mp,emis,999,nothing    ! high material number so ANSYS won't complain during
 radiation computation

!-------------------------------------------------------------------------
----
!   Define offset temperature
toffst,460
/eof
```