F2 REFERENCES: DESIGN INPUTS

The PCSA is based on a snapshot of the design. The reference design documents are appropriately documented as design inputs in this section. Since the safety analysis is based on a snapshot of the design, referencing subsequent revisions to the design documents (as described in EG-PRO-3DP-G04B-00037, *Calculations and Analyses* (Ref. 2.1.1, Section 3.2.2.F)) that implement PCSA requirements flowing from the safety analysis would not be appropriate for the purpose of the PCSA.

The inputs in this Section noted with an asterisk (*) indicate that they fall into one of the designated categories described in Section 4.1, relative to suitability for intended use. The inputs noted with a dagger (†) indicate cancelled or superseded documents for which the snapshot has not yet been updated.

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F3 BOUNDARY CONDITIONS

F3.1 INTRODUCTION

The general boundary conditions used during the analysis of fire vulnerabilities and fire model development are clearly stated and documented. In general, the boundary conditions are compatible with those usually applied to fire events. The principal boundary conditions for the fire analysis are listed in the following sections:

F3.2 PLANT OPERATIONAL STATE

Initial state of the facility is normal, with each system operating within its limiting condition of operation.

F3.3 CREDIT FOR AUTOMATIC FIRE SUPPRESSION SYSTEMS

The automatic fire suppression systems, although designed to meet all requirements and standards for fire suppression systems in nuclear facilities, are considered not important to safety, and therefore no credit is taken for their operation.

F3.4 NUMBER OF FIRE EVENT TO OCCUR

The facility is analyzed to respond to one fire event at a given time. Additional fire events, as a result of independent causes or of re-ignition once a fire is extinguished are not considered.

F3.5 IGNITION SOURCE COUNTING

Ignition sources are counted in accordance with applicable counting guidance contained in NUREG/CR-6850 (Ref. F2.2.73 and Ref. F2.2.74).

F3.6 FIRE CABLE AND CIRCUIT FAILURE ANALYSIS

Unlike nuclear power plants, which depend on the continued operation of equipment to prevent fuel damage, the YMP facilities cease operating on loss of power or control. Therefore, fire damage in rooms that do not contain waste cannot result in an increased level of radiological exposure. Cable and circuit analysis in these rooms is not required.

F3.7 HEATING, VENTILATION, AND AIR CONDITIONING FIRE ANALYSIS

Heating, ventilation, and air conditioning (HVAC) is not relied upon to mitigate potential releases associated with large fire event sequences. In recognition of a large amount of fire generated, non-radiological particulates could render the HVAC filters ineffective. HVAC can be credited for localized fires unless HVAC control or power circuits are present in the area of the fire.

F3.8 NO OTHER SIMULTANEOUS INITIATING EVENTS

It is standard practice to not consider the occurrence of other initiating events (human-induced and naturally occurring) during the time span of an event sequence because (1) the probability of

two simultaneous initiating events within the time span is small, and (2) each initiating event will cease operations of the Canister Receipt and Closure Facility (CRCF), which further reduces the conditional probability of the occurrence of a second initiating event, given the first has occurred.

F3.9 DATA COLLECTION SCOPE

The fire ignition data collection and analysis are performed for locations relevant to waste handling in the facilities.

F3.10 COMPONENT FAILURE MODES

The failure mode of a structure, system, or component affected by a fire, is the most severe with respect to consequences. For example, the failure mode for a canister could be the overpressurization of a reduced-strength canister.

F3.11 COMPONENT FAILURE PROBABILITY

Fires large enough to fail waste containment components are large enough to fail all active components in the same room. Active components fail in a de-energized state for such fires.

F3.12 INTERNAL EVENTS PRECLOSURE SAFETY ANALYSIS MODEL

To implement the systems analysis guidance contained herein, the fire PCSA team uses the internal events PCSA model, which is developed concurrently with the fire PCSA. This internal events PCSA is used as the basis for the fire PCSA. The internal events PCSA is in general conformance with the American Society of Mechanical Engineers Probabilistic Risk Assessment standard (Ref. F2.2.2).

F4 ANALYSIS METHOD

F4.1 INTRODUCTION

Nuclear power plant fire risk assessment techniques, as discussed in the following sections, have limited applicability to facilities such as the CRCF or other facilities in the geologic repository operations area. The general methodological basis of this analysis is the *Chemical Agent Disposal Facility Fire Hazard Assessment Methodology*, (Ref. F2.2.77) which applies to facilities that are similar to the geologic repository operations area in that they are handling and disposal facilities for highly hazardous materials. This approach is data based, in that it utilizes actual fire ignition and fire propagation experience to determine fire initiating event frequencies. That approach has been adapted to utilize data applicable to the YMP waste handling facilities. To the extent applicable to a non-reactor facility, NUREG/CR-6850, *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, Volumes 1 and 2* (Ref. F2.2.73 and Ref. F2.2.74) are also considered in the development of this analysis method. The method complies with the applicable requirements of the American Nuclear Society fire Probabilistic Risk Assessment standard (Ref. F2.2.1) that are relevant to a nonreactor facility. Many of the definitions, modeling approximations, and requirements of these documents were used to develop this document.

F4.2 IDENTIFICATION OF INITIATING EVENTS

Current techniques in fire risk assessment for nuclear power plants focus on fire that can damage electrical and control circuits or impact other equipment that can compromise process and safety systems. This type of approach is not generally applicable to YMP because loss of electric power is a safe state, except for the need for HVAC after a release of radionuclides. In general, when systems are affected by fire, they cease to function. While at a nuclear power plant fire is of concern, at YMP fire means that fuel handling stops and initiating events capable of producing elevated levels of radioactivity are essentially unrealizable. While it is theoretically possible that a fire could inadvertently result in a drop of a cask or canister, it is difficult (if not impossible) to identify any mechanisms by which this would occur due to fire that would not be much more likely to occur by other means. Of much greater concern at YMP is the potential for a fire to directly affect the waste containers and cause a breach that would result in a release. The fire analysis, therefore, focuses on the potential for a fire to directly affect the waste containers and cause a breach that would result in a release, rather than analyzing fires that would remove power from fuel handling systems. After a release of radionuclides, the HVAC system, with its high-efficiency particulate air (HEPA) filtration, aids in the abatement of radioactivity that is released from buildings. However, the occurrence of fires tends to significantly reduce the effectiveness of HEPA filtration; the fire event sequence analysis, therefore, does not rely on this system. Consideration is given both to fires that start in rooms containing waste and fires that start in other rooms and propagate to where waste is located. The steps of this process are provided in the following sections.

F4.2.1 Identify Fire-Rated Barriers and Designate Fire Zones

The facility is broken into fire zones based on the location of fire-rated barriers. The rating of these barriers is not significant to the methodology, so all rated barriers are considered. In order

for a fire zone to exist, the penetrations, doorways, and ducts must also be limited to the perimeter of the zone. Note that a floor is always considered to be a fire barrier as long as it is solid. Zones are identified by a number, determined by the analyst, and will consist of one or more rooms.

F4.2.2 Identify the Rooms Where Waste can be Present

Each room where waste is present, even if only for a brief time, is listed. The first set of fire initiating events to be considered in the PCSA is fires that affect each of these rooms, but do not affect other rooms that could contain waste.

F4.2.3 Define Local Initiating Events

Fire ignition occurrences are identified for each room within a fire zone. The total occurrences of a fire within a room containing a waste form are composed of the occurrences of ignitions in that room plus the occurrences of ignitions in surrounding rooms within the fire zone, which propagate across room boundaries to the room containing the waste form. The locations of fire initiating events are identified in the master logic diagram.

F4.2.4 Define Large Fire Initiating Events

Traditional fire risk studies for nuclear power plants have tended to ignore large fires, arguing that the fire barriers in place will prevent such occurrences. However, actual observed historical data shows that large fires in buildings occur. Large fires are defined for this study as those that spread to encompass the entire building, as recognized in the latest fire risk guidance from *Fire PRA Methodology for Nuclear Power Facilities* (Ref. F2.2.73) and *Summary & Overview* EPRI TR-1011989 and NUREG/CR-6850 (Ref. F2.2.74, Volume 1, Section 11.5.4, for example). There, potential large fire initiating events are identified. The general approach follows.

Except during the short time that waste forms are being lifted by a canister transfer machine, in the YMP facilities, waste forms are located on the ground floor. Continuing with the focus on rooms that contain waste forms, large fires may be divided two ways. One is associated with fires that start on the ground floor and spread to the entire building. The other is a fire that starts anywhere else in the building and spreads to the entire building.

As a practical analysis technique, any fire that spreads out of a fire area is considered a large fire.

F4.3 QUANTIFICATION OF FIRE IGNITION FREQUENCY

The quantification of initiating event frequency involves three steps. First, the overall frequency of fire ignition for the facility is determined, then that frequency is allocated to the individual room in the facility based on the number and types of ignition sources in the rooms. Types of ignition sources are characterized in general terms such as mechanical, electrical, combustible liquid. Finally, propagation probabilities are applied to determine the overall frequency that a fire reaches the area of the waste. Quantification uses data from the following sources for equipment ignition frequencies and conditional probabilities of propagation:

- *Detailed Methodology*, Volume 2 of *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities.* (Ref. F2.2.73)
- *Summary & Overview*, Volume 1 of *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities.* (Ref. F2.2.74)
- *Fires in or at Industrial Chemical, Hazardous Chemical, and Plastic Manufacturing Facilities: 1988 - 1997 Unallocated Annual Averages and Narratives* (Ref. F2.2.75)
- *Structure Fires in Radioactive Material Working Facilities and Nuclear Energy Plants of Non-Combustible Construction, 1980-1998* (Ref. F2.2.76)
- *Chemical Agent Disposal Facility Fire Hazard Assessment Methodology* (Ref. F2.2.77)
- *Utilisation of Statistics to Assess Fire Risks in Buildings* (Ref. F2.2.78).

F4.3.1 Determine the Overall Facility Fire Frequency

There is insufficient data available regarding the total frequency of fires in facilities comparable to YMP. NUREG/CR-6850 (Ref. F2.2.73 and Ref. F2.2.74) provides an overall frequency for a typical nuclear power plant, but these are much larger and complex than the YMP facilities. Therefore, it has been decided to use a more generic fire ignition frequency approach that relates building size to total fire frequency for various broad categories of facilities (*Utilisation of Statistics to Assess Fire Risks in Buildings* (Ref. F2.2.78). This approach applies the following equation to overall fire ignition frequency.

Determine the Fire Frequency per Unit Area – The frequency per unit area is expressed by Equation F-1:

$$_{fm}(A) = {}_{c1}A^{r} + c_2A^{s} \qquad \text{(Eq. F-1)}$$

where f_m is the fire ignition frequency per m^2-yr, A is the floor area (in m^2) and c_1, c_2, r, and s are coefficients that were determined from historical data observations for different types of facilities.

For industrial buildings, the parameter values are as follows in Equation F-2:

$$c_1 = 3 \times 10^{-4};\ c_2 = 5 \times 10^{-6};\ r = -0.61;\ \text{and } s = -0.05 \qquad \text{(Eq. F-2)}$$

This first equation relates the frequency per unit area to the total area of the facility. This correlation was determined from the historical data, which showed that total fire frequency was not linearly related to the size of the facility. Rather, the frequency per unit area was affected by the size of the facility, and the larger the facility the lower the frequency per unit area was.

Determine the Total Fire Frequency for the Facility – The total frequency of fire ignition for the building is thus represented by the Equation F-3:

$$f_{fire} = f_m(A) * A \qquad \text{(Eq. F-3)}$$

F4.3.2 Determine the Fire Ignition Frequency in Each Room

The approach to allocating the fire ignition frequency is based on the approach used in Ref. F2.2.73, Ref. F2.2.74, and Ref. F2.2.77. Both of these approaches determine the fraction of the total facility ignition frequency associated with various categories of equipment (i.e., ignition source category), then determine a facility-specific ignition frequency for each piece of equipment in each category, and then determine the total ignition frequency in the room based on the ignition source population in the room.

F4.3.2.1 Fraction of Fire Ignition Frequency Associated with Each Ignition Source Category

NUREG/CR-6850 (Ref. F2.2.73 and Ref. F2.2.77) has data for these frequencies for chemical process plants. Neither of these data sets is the best for the facilities at YMP. Therefore, the National Fire Protection Association (NFPA) was requested to provide an analysis (Ref. F2.2.76) of the data in their proprietary database on the distribution of fires by equipment type in all nuclear facilities of non-combustible construction. NFPA distinguishes between a large number of equipment types that can cause ignition of a fire. There is an insufficient amount of data to justify retaining this number of equipment types, so the equipment types were consolidated into a set of ignition source categories. These categories are defined in Appendix F.I.

Using the data by category, an analysis is performed to determine the fraction of fires that are caused by each category. That analysis is documented in Appendix F.II.

The total fire ignition frequency from Section F4.3.1 is multiplied by each of these factors to determine the total fire ignition frequency due to each equipment type. For example, the total ignition frequency due to electrical equipment for a given facility as follows in Equation F-4:

$$f_{elec\text{-}all} = f_{fire} * 0.086 \qquad \text{(Eq. F-4)}$$

F4.3.2.2 Individual Ignition Source Fire Ignition Frequency

The next step is to determine the fire ignition frequency from each piece of equipment in each category. As is done in NUREG/CR-6850 (Ref. F2.2.73 and Ref. F2.2.74) and *Chemical Agent Disposal Facility Fire Hazard Assessment Methodology* (Ref. F2.2.77), the frequency contribution for each equipment type is divided by the total number of pieces of equipment in the facility For example, in the case following from the above example for the frequency of fire

ignition from electrical equipment, if there are 50 pieces of electrical equipment in the facility, the ignition frequency for each piece of equipment follows in Equation F-5:

$$f_{elec\text{-}each} = f_{elec\text{-}all} / 50 \qquad \text{(Eq. F-5)}$$

For the case of the category "no equipment involved" the ignition frequency is per unit area, so the total for this category is divided by the total floor area of the facility (which was already determined in Section F4.3.1).

F4.3.2.3 Allocation of Fire Ignition Frequency to Each Room

The final step is to use the per equipment values to allocate fire frequency to each room. This is done by counting the number of ignition sources of each type contained in each room, multiplying by the ignition frequency for each ignition source type, and summing across all types. For example, if Room 1 has six pieces of electrical equipment, then the ignition frequency in that room due to electrical equipment is as follows in Equation F-6:

$$f_{elec\text{-}1} = f_{elec\text{-}each} * 6 \qquad \text{(Eq. F-6)}$$

Determining this frequency for each ignition source type (including multiplying the "no equipment involved" per unit area by the floor area of the room) and summing them together yields the total fire ignition frequency for the room, as follows in Equation F-7:

$$f_1 = f_{elec\text{-}1} + f_{hvac\text{-}1} + f_{\ldots\text{-}1} \qquad \text{(Eq. F-7)}$$

F4.4 DETERMINE INITIATING EVENT FREQUENCY

The definition of each initiating event includes the implicit condition that the fire actually threatens a target that contains radioactive material. Therefore, for each initiating event, the initiating event frequency considers two aspects; the fraction of time there is a waste container in the room, and the probability a fire propagates to that waste container.

F4.4.1 Probability of Presence of a Target

The probability of the presence of a target waste form is the fraction of time that the waste form(s) is in the area affected by the fire (e.g., for a room fire it is the fraction of time a waste form is in the room). For use in initiating event frequency equations, the probability is represented as follows:

P_{wri} = probability that a particular waste form is in room i during the preclosure period

P_{wzi} = probability that a particular waste form is in zone i during the preclosure period

P_{wfi} = probability that a particular waste form is on floor i during the preclosure period

P_{wb} = probability that a particular waste form is in the building during the preclosure period/

The specific phrasing is noted. This probability pertains to each individual waste form (i.e., one of the approximately 11,000 waste forms that are handled at YMP). For example, if each waste form that passes through the CRCF spends 60 minutes in the canister transfer room, the probability that it is present when a fire occurs is 60 min/(50 yrs × 8760 hrs/yr × 60 min/hr). This probability is used to correct the final initiating event frequency for fires (normally expressed as per year) to be per operation over the preclosure period so that it is equivalent to the other internal initiating events (e.g., drops) and can be multiplied by the number of operations in same manner.

F4.4.2 Probability of Propagation to a Target

Of key interest for assessing the fire risk, is the extent to which fires that start in a "benign" area can spread to sensitive areas (i.e., areas where nuclear waste is present). The likelihood of fire propagation within the building is strongly dependent on the building construction and the presence of automatic fire suppression systems.

Both probabilities of exceedance and conditional probabilities were determined. The probabilities of exceedance are the probabilities that a fire propagates up to a specified limit or beyond. The conditional probabilities are probabilities that a fire spreads to a specified limit.

Probabilities of exceedance are not independent, but rather represent the total probability that a fire spreads up to the specified limit or beyond. These values are provided because, for many fire sequences there will only be one case of interest, (i.e., there is only one target of concern, and once the fire reaches that target the fact that the fire may propagate even further does not change the outcome of the sequence in terms of release). For example, this value could be applied to a case where a fire that spreads throughout a room affects the waste form in that room, and there are no additional waste forms in adjacent rooms or fire zones.

Conditional probabilities are independent, as they represent the probability that a fire spreads to precisely the specified limit. These values are provided to address those cases where the extent of propagation will define the number of targets involved in the fire. For example, these values are applied when a fire that spreads throughout a room affects a waste form in that room; but if it spreads to adjacent rooms, additional forms are involved.

There are two types of propagation that are considered; propagation within a room and propagation between rooms.

F4.4.2.1 Fire Propagation Within Rooms

An important consideration in the fire risk assessment is propagation within a given room. This is referred to as "in-room propagation." Propagation within the room is important for fires initiated in a room where waste is present. In this case, the question is whether the fire, which can ignite wherever there is an ignition source in the room, reaches the area within the room in which the waste is located.

This section provides a table with the in-room propagation values for the cases with and without automatic fire suppression systems functioning. To use this table to determine whether the fire

spreads sufficiently to threaten waste forms, it is necessary to consider where the fire occurs in the room of interest. The steps in this process are as follows:

- Determine the distribution of the ignition sources (identified under Section F4.3.2.3) within the room by counting the total number of potential ignition sources that are "at," "near," or "far from" the target waste form.[1]

- Calculate the fraction of ignition sources "at," "near," and "far from" the target waste form by dividing the number at each location by the total in the room.

- Calculate the frequency of the fire reaching the waste form using the Equation F-8:

$$f_{ier\text{-}i} = P_{wri}\,[f_i\,(FR_a + (FR_n \times (P_{pc} + P_{rc})) + (FR_f \times P_{rc}))] \qquad \text{(Eq.F-8)}$$

where

$f_{ier\text{-}i}$	=	frequency of fire affecting waste form, i-th room
P_{wri}	=	probability that a waste form is in the i-th room
f_i	=	frequency of ignition, i-th room
FR_a	=	fraction of ignition sources at the waste form
FR_n	=	fraction of ignition sources near the waste form
P_{pc}	=	conditional probability for fire confined to part of room of origin
FR_f	=	fraction of ignition sources far from the waste form
P_{rc}	=	conditional probability for confined to room of origin

The values for P_{pc} and P_{tc} in the previous equation were developed from the analysis performed by NFPA (Ref. F2.2.76). The derivation of the values is provided in Appendix F.II for two cases (automatic fire suppression available and automatic fire suppression unavailable). The frequency f_i is the sum of frequencies of ignition of all ignition sources in the room. The fraction of ignition sources at, near, and far from the waste form was developed from equipment layout drawings such as:

- *Canister Receipt & Closure Facility #1 ITS Train "A" Electrical Room Equipment Layout* (Ref. F2.2.10)

- *Canister Receipt and Closure Facility 1 General Arrangement Ground Floor Plan* (Ref. F2.2.13).

[1] In the context of this method, an ignition source within a few feet of the waste source is "at" the source, whereas an ignition source beyond this distance, but within a few yards of the waste source is "near" the source. Ignition sources more that a few yards distant would be "far from" the waste source. This definition coordinates with the fire response model given in Attachment D.

F4.4.2.2 Fire Propagation Beyond Rooms

This section provides propagation probabilities for fires spreading beyond the room in which they start. This type of propagation is referred to as "ex-room propagation."

This section provides a table with the ex-room propagation values for the cases with and without automatic fire suppression systems functioning. To use this table to determine whether the fire spreads sufficiently to threaten waste forms, it is necessary to consider the various rooms where the fire could start and spread to the extent defined by the initiating event. The steps in this process are as follows:

- For each initiating event, identify all of the rooms within the area defined by the initiating event. For example, for a fire involving a specific fire zone, list all the rooms in that zone. For a fire involving an entire floor, list all the rooms on the floor. For a fire involving the entire building, list all rooms in the building.

- For each room, calculate the probability that a fire that starts within the room is not confined to the next smaller fire initiating event but is confined to less than the definition of the next largest initiating event by multiplying the ignition frequency for the room by the conditional probability (or sum of conditional probabilities) that the fire spreads at least as far as defined, but no further. For example, for a fire involving a floor where there is also an initiating event for a fire involving a zone on the floor and an initiating event involving the entire building (multiple floors or beyond), Equation F-9 is used:

$$f_{ief\text{-}fj\text{-}ri} = f_i \times P_{fc} \qquad \text{(Eq. F-9)}$$

where

$f_{ief\text{-}fj\text{-}ri}$	=	frequency of fire in zone j starting in room i
f_i	=	frequency of ignition, i-th room
P_{fc}	=	conditional probability for fire confined to the floor of origin

Similarly, for a fire involving a floor where there is an initiating event for a fire in a zone on the floor and no specific initiating event for a fire involving the entire building Equation F-10 is used:

$$f_{ief+\text{-}ri} = f_i \text{ x } (P_{fc} + P_{bc} + P_{b+c}) \qquad \text{(Eq. F-10)}$$

where

$f_{ief+\text{-}ri}$	=	frequency of fire involving an entire floor or greater starting in room i
f_i	=	frequency of ignition, i-th room
P_{fc}	=	conditional probability for fire confined to floor of origin

P_{bc} = conditional probability for fire confined to building of origin

P_{b+c} = conditional probability for fire extending beyond building of origin[2].

The total fire frequency of the defined severity is the sum across all rooms relevant to the initiating event, as discussed above.

F4.4.3 Initiating Event Frequency

The final initiating event frequency is determined by multiplying the frequency of the fire reaching the waste form (in occurrences over the 50-year preclosure period) times the probability that a waste form is present (fraction of time over the 50-year preclosure period per waste form) times 50 (years/preclosure period). This yields the initiating event frequency for a fire of a specific severity affecting a waste form, per waste form processed, over the preclosure period.

F5 ANALYSIS

F5.1 INTRODUCTION

Fire initiating event frequencies have been calculated for each initiating event identified for the CRCF. This section details the analysis performed to determine these frequencies, using the methodology documented in Section F4. The following discussion of the analysis presupposes that the reader has developed a thorough understanding of the details of that methodology, as those details are not repeated in this section. The tables presented in this section, unless otherwise noted, are images of the actual spreadsheets used to perform the calculations. Therefore, there are no typographical errors in the translation of the results of the calculations into this report. The spreadsheet cells are color-coded to aid the analyst. Green numbers indicate values that are input by the analyst specific to the facility. Black numbers result from "off-line" calculations performed for this study. That is, they are facility-specific parameters whose values were determined as part of this analysis, but are not directly linked to the cell (i.e., they needed to be entered by the analyst). The source for these values is indicated in the text description of the spreadsheet. Orange numbers are values based on the analysis of operational experience (e.g., NFPA data), and should generally not be changed unless the analysis of operational experience changes or is updated. Red numbers are calculated values and should never be changed by the analyst. Green shaded cells are parameters that are assigned distributions that are used for the Crystal Ball Monte Carlo simulation runs discussed in Section F5.8. The aqua shaded cells are the final initiating event frequencies. The values shown in the cells are the baseline, point estimate values. The Monte Carlo simulation runs convert these values into distributions for use in the event sequence quantification.

F5.2 INITIATING EVENT FREQUENCIES

Fire ignition frequencies are based upon the total floor area of the building. Thus, the assessment of the area of each room of the CRCF is the first step in obtaining initiating event frequencies.

[2] Note that the definition of a fire extending beyond the building of origin does not imply that the fire crosses some distance to affect other buildings or objects, but rather that the fire (i.e., flame damage) affects the outside surfaces of the building and items attached thereto.

Table F5.2-1 shows the calculations that were performed to identify individual room areas, total ignition frequency, and uncertainty distributions.

F5.2.1 Room Area

Dimensions for room area calculations were obtained from the following CRCF general layout drawings:

- *Canister Receipt and Closure Facility 1 General Arrangement Ground Floor Plan* (Ref. F2.2.13)
- *Canister Receipt and Closure Facility 1 General Arrangement Second Floor Plan* (Ref. F2.2.14)
- *Canister Receipt and Closure Facility 1 General Arrangement Third Floor Plan* (Ref. F2.2.15).

In some cases, the dimension intervals shown on the general arrangement drawings matched the boundaries of the rooms. Where this was the case these values were used to define the dimensions of the rooms. In cases where these (the dimension intervals) did not accurately represent a room, the drawing scale and a straightedge was utilized to determine the dimensions. The length and width figures obtained were entered into the L1 (ft) and L2 (ft) columns of Table F5.2-1 and multiplied to produce the area in square feet. Rooms 1015 and 2004 occupy two floors of building space. The area obtained for these rooms was doubled to account for this. Similarly, rooms 1026, 1044, 1047, and 1049 occupy three floors of building space, and the area for these rooms was tripled. Rooms 1005B, 1005C, 1005D, 1005F, 1005G, 1005H, 1012, 1026, 1028, 1033, 1035, 1211-1213 and 1215 to 1222, 2001, 2005, 2006K, 2008, 2045, 2045A, 3045, and 3045A are not of a standard rectangular shape whose area can be calculated by a single length and width. Thus, these rooms were divided into two to three rectangles, each with a determined length and width. Addition of the area of these rectangles provides the total room area. Rooms 1007, 1013, 1045, 1047A, 1049A, 2003, and 2007 contain smaller room(s) within themselves. To account for this, the red text indicates a reference to the cells that contain the dimensions of the smaller room(s), the area of which is subtracted from the area of the room containing it. All areas calculated in square feet were multiplied by 0.09290304 to obtain the area in square meters, since Equation F-1 is based in square meters.

Table F5.2-1. Room Areas and Total Ignition Frequency

Room	L1(ft)	L2(ft)	A(sq-ft)	A(sq-m)	L3 (ft)	L4(ft)	L5(ft)	L6(ft)	L7(ft)	L8(ft)		
1001	76	33	2508	233								
1001A	38	40	1520	141								
1002	24	33	792	74								
1002A	15	9	135	13								
1003	44	40	1760	164								
1004	32	40	1280	119								
1005A	138	8	1104	103								
1005B	7	72	728	68	28	8						
1005C	6	70	552	51	9	6	6	13				
1005D	53	8	720	67	12	12	8	19				
1005E	96	13	1248	116								
1005F	133	8	1176	109	14	8						
1005G	7	64	568	53	12	10						
1005H	8	55	624	58	8	23						
1005J	217	7	1519	141								
1007	60	78	4413	410	43	9	15	8				
1007A	43	9	387	36								
1008	30	59	1770	164								
1008A	30	9	270	25								
1009	10	50	500	46								
1010	24	58	1392	129								
1011	58	58	3364	313								
1012	28	48	1584	147	20	12						
1013	32	59	1768	164	12	10						
1013A	12	10	120	11								
1014	45	92	4140	385								
1015	83	86	14276	1326	*Area multiplied by two - Room extends two floors							
1016	36	10	360	33								
1017	40	10	400	37								
1018	82	28	2296	213								
1019	82	28	2296	213								
1020	36	10	360	33								
1021	30	11	330	31								
1022	30	10	300	28								

Table F5.2-1. Room Areas and Total Ignition Frequency (Continued)

Room	L1(ft)	L2(ft)	A(sq-ft)	A(sq-m)	L3 (ft)	L4(ft)	L5(ft)	L6(ft)	L7(ft)	L8(ft)		
1023	30	28	840	78								
1024	30	28	840	78								
1025	30	10	300	28								
1026	84	89	23070	2143	6	17	7	16	*Area (x3) - Room extends three floors			
1027	40	92	3680	342								
1028	57	78	4558	423	14	8						
1029	30	59	1770	164								
1029A	30	9	270	25								
1030	10	50	500	46								
1031	25	60	1500	139								
1032	57	58	3306	307								
1033	28	46	1554	144	19	14						
1034	32	16	512	48								
1035	40	44	1984	184	32	7						
1036	33	78	2574	239								
1036A	38	59	2242	208								
1036B	10	22	220	20								
1037	25	22	550	51								
1038	32	13	416	39								
1039	15	28	420	39								
1040	15	28	420	39								
1041	32	16	512	48								
1042	15	30	450	42								
1043	13	30	390	36								
1044	10	7	210	20	*Area multiplied by three - Room extends three floors							
1044A	10	8	80	7								
1045	32	16	292	27	10	7	10	7	10	8		
1046	10	7	70	7								
1047	17	16	816	76	*Area multiplied by three - Room extends three floors							
1047A	28	35	708	66	17	16						
1048	28	16	448	42								
1049	17	16	816	76	*Area multiplied by three - Room extends three floors							
1049A	28	35	708	66	17	16						
1050	28	16	448	42								
1051	15	23	345	32								
1052	15	23	345	32								

Table F5.2-1. Room Areas and Total Ignition Frequency (Continued)

Room	L1(ft)	L2(ft)	A(sq-ft)	A(sq-m)	L3 (ft)	L4(ft)	L5(ft)	L6(ft)	L7(ft)	L8(ft)		
1053	15	20	300	28								
1054	15	21	315	29								
1201 - 1210	76	32	2432	226								
1211 - 1213 & 1215 - 1222	43	58	3174	295	34	20						
1214	32	18	576	54								
2001	58	78	4659	433	15	9						
2002	29	68	1972	183								
2003	36	69	2276	211	13	16						
2003A	13	16	208	19								
2004	230	90	41400	3846	*Area multiplied by two - Room extends two floors							
2005	75	78	5500	511	25	14						
2005A	25	14	350	33								
2006A	138	7	966	90								
2006B	76	10	760	71								
2006D	88	11	968	90								
2006E	80	7	560	52								
2006F	68	6	408	38								
2006G	173	8	1384	129								
2006H	72	6	432	40								
2006J	87	11	957	89								
2006K	8	82	784	73	16	8						
2007	36	90	2664	247	24	12	24	12				
2007A	24	12	288	27								
2007B	24	12	288	27								
2008	58	78	4660	433	17	8						
2010	29	69	2001	186								
2011	36	67	2412	224								
2011A	17	12	204	19								
2012	78	68	5304	493								
2038	33	13	429	40								
2039	15	30	450	42								
2040	15	30	450	42								
2041	32	16	512	48								
2042	15	30	450	42								
2043	13	30	390	36								
2045	15	8	160	15	5	8						

Table F5.2-1. Room Areas and Total Ignition Frequency (Continued)

Room	L1(ft)	L2(ft)	A(sq-ft)	A(sq-m)	L3 (ft)	L4(ft)	L5(ft)	L6(ft)	L7(ft)	L8(ft)		
2045A	15	8	160	15	5	8						
2046	9	7	63	6								
2048	28	16	448	42								
2050	29	16	464	43								
3001	110	8	1298	121	38	11						
3002	36	11	652	61	8	32						
3038	33	13	429	40								
3041	32	16	512	48								
3045	15	8	160	15	5	8						
3045A	15	8	160	15	5	8						
3046	10	7	70	7								
3048	28	16	448	42								
3050	29	16	464	43								
Total Area (sq-m)				19611		50% Value		97.5% Value				
Ignition Frequency (per sq-m/yr)				3.77E-06	3.77E-06	3.77E-06		9.06E-06				
Ignition Frequency (per yr)				7.40E-02								
Ignition Frequency (50 years - preclosure period)				3.70E+00								

NOTE: Blank cells in this table are intentional and have been verified.

ft = foot; m2 = square meter; sq ft = square foot; yr = year.

Source: Original

F5.2.2 Building Ignition Frequency

Ignition frequency calculations are presented at the bottom of Table F5.2-1, and begin with the total area calculation. This is obtained by summing the areas (in square meters) of all rooms in the building. The ignition frequency per square meter per year line implements Equation F-1. The ignition frequency per year line implements Equation F-3. The ignition frequency over the 50 year period is obtained by multiplying the latter value by 50. As can be seen from the table, the expected number of ignition events over the preclosure period is approximately four.

The values shown are the baseline mean values for ignition frequency. An uncertainty analysis was performed on the results of Equation F-1 for the use of Crystal Ball software to run Monte Carlo simulations to obtain fire initiating event frequency distributions. The geometric mean and 97.5% values of the resulting distribution for Equation F-1 are shown on the table. Refer to Appendix F.III for the calculations performed to develop the uncertainty distribution.

F5.3 IGNITION SOURCE FREQUENCY

As discussed in Section F4.3.2.1, an industrial building fire can begin as the result of numerous types of ignition sources, which have been grouped into nine categories:

- Electrical
- HVAC
- Mechanical equipment
- Heat generating equipment
- Torches, welders, and burners
- Internal combustion engines
- Office/kitchen equipment
- Portable equipment
- No equipment involved.

Each category has a fraction representing the probability that, given an ignition, that category is the source of the ignition. The mean values of these fractions are shown in the column labeled Category Fraction in Table F5.3-1. The derivation of these values is discussed in Appendix F.II. The column labeled Category Frequency implements the generic form of Equation F-4 to determine the mean ignition frequency associated with each ignition source. The next column, category population, contains the total number of ignition sources in each category in the facility. This is either the actual count of sources, a weighted point score of sources, or (for the case of no equipment involved) the total floor area of the facility. The source of the count or score is presented in the next section. The floor area is taken from Table F5.2-1, fourth row from the bottom. The fifth column uses the previous two columns to implement Equation F-5 to determine the frequency per ignition source unit (i.e., per ignition source, per ignition source weighted point, or per square meter of floor area). These values are used in the next section to allocate fire ignition frequency to each room in the facility.

Table F5.3-1. Ignition Frequency by Ignition Source

Category	Category Fraction	Category Frequency (50 years)	Category Population	Frequency per Unit (50 years)		Normalized Value	Sampled Value	Mean Fraction	97.5% Value	97.5th percentile add
Electrical	0.086	3.11E-01	273	1.14E-03		0.086	0.086	0.086	1.26E-01	4.05E-02
HVAC	0.080	2.92E-01	64	4.56E-03		0.080	0.080	0.080	1.20E-01	3.93E-02
Mechanical Equipment	0.139	5.06E-01	68	7.44E-03		0.139	0.139	0.139	1.89E-01	5.01E-02
Heat Generating Equipment	0.155	5.64E-01	0	0.00E+00		0.155	0.155	0.155	2.07E-01	5.24E-02
Torches, welders, burners	0.219	7.97E-01	1381	5.77E-04		0.219	0.219	0.219	2.79E-01	5.99E-02
Internal combustion engines	0.021	7.64E-02	200	3.82E-04		0.021	0.021	0.021	4.23E-02	2.09E-02
Office/kitchen equipment	0.064	2.33E-01	10	2.33E-02		0.064	0.064	0.064	9.97E-02	3.55E-02
Portable Equipment	0.102	3.71E-01	60	6.19E-03		0.102	0.102	0.102	1.45E-01	4.37E-02
No equipment involved	0.134	4.88E-01	19234	2.54E-05		0.134	0.134	0.134	1.83E-01	4.93E-02
	1.000	3.6E+00				1.000				

NOTE: Blank cells in this table are intentional and have been verified.

HVAC = heating, ventilation, and air conditioning.

Source: Original

As stated previously, these are mean values. The right hand group of columns is used by Crystal Ball to apply an uncertainty distribution to each of the category fraction values for the purpose of developing uncertainty distributions on initiating event frequency. The mean fraction, 97.5% value, and 97.5th percentile add columns show the parameters of these distributions. The development of all of the values is detailed in Appendix F.II. When Crystal Ball is run, it creates a sampled value for each fraction in the sampled value column. The spreadsheet then determines a normalized value by first assuring that each sampled value is not negative (minimum value of zero) and then normalizing the values so that the sum is always equal to one. The normalized value for each trial then replaces the category fraction value in the calculation. These probabilities must always add to one, as the groupings include all possible sources of ignition.

F5.4 IGNITION SOURCE DISTRIBUTION (EQUIPMENT LIST)

Compiling an initiating event frequency for the CRCF is dependant on identifying many characteristics of the building, to include ignition sources. Ignition sources are defined as items which exist in the rooms of the building that have the potential to contribute to the initiation and/or propagation of a fire. These sources are grouped into eight categories

- Electrical equipment
- HVAC equipment
- Mechanical process equipment
- Heat-generating process equipment
- Torches, welders, and burners
- Internal combustion engines
- Office and kitchen equipment
- Portable and special equipment.

Once the grouping for a source is determined, it is assigned a count (points), a number which specifies the significance of the source by its contribution to fire ignition. Counts are integral to the calculations, as the total count for each category and room are multiplied by the ignition source frequency and summed to obtain the room ignition frequency. Table F5.4-1 shows the results of the ignition source distribution assessment for the CRCF. The red numbers on this table highlight the actual count used, so as to make identification of the equipment count values easy to pick out from the other equipment identification information provided. Pieces of equipment that are in the room in question but do not count as ignition sources per the counting rules are shown as strikethrough text. The following sections describe how the equipment was identified, categorized, and counted for the building.

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Table F5.4-1. Ignition Source Population by Room

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1001 (LLW Staging Room)			~~LLW Staging Room Door~~ • ~~2 hp~~		Portable Welding Receptacle – WWF = 5 point			
1001A (HVAC Room)		2 Air Handling Units 060-VNT0-AHU-00015 • 20 hp 060-VNT0-AHU-00016 • 20 hp						2.9% of all such equipment • 2 points
1002 (North Maintenance Vestibule)			~~2 N Maint. Vest. Doors~~ • ~~2 hp (ea.)~~					
1002A (Personnel Vestibule)								
1003 (HVAC Room)		Air Handling Units, 4 motors 060-VCTO-AHU-00001 • 30 hp(supply) • 15 hp(return) 060-VCTO-AHU-00002 • 30 hp(supply) • 15 hp(return)						2.9% of all such equipment • 2 points
1004 (HVAC Room)	1 Lighting Panel • 480/277 VAC • 60 Hz	2 HEPA Filter Units (hpn/a) 060-VCT0-FLT-00015 060-VCT0-FLT-00016 2 Exhaust Fans 060-VCT0-EXH-00011 060-VCT0-EXH-00012 • 30 hp						2.9% of all such equipment • 2 points
1005A (Corridor)								
1005B (Corridor)								
1005C (Corridor)								
1005D (Corridor)								
1005E (Corridor)								
1005F (Corridor)								
1005G (Corridor)								
1005H (Corridor)								
1005J (Corridor)								

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1007 (Electrical Room)	2 480V Load Centers EEN0-LC-00001 EEN0-LC-00002 • 7 cabs • 6 cabs 480V MCCs EEN0-MCC-00001 • **12 cabs** EEN0-MCC-00002 • **17 cabs** EEN0-MCC-00003 • **13 cabs** EEN0-MCC-00004 • **19 cabs** ~~13.8 kVA Dist Xfmr (A, B)~~ ~~XFMR-00001~~ ~~XFMR-00002~~ ~~XFMR-00001~~ ~~XFMR-00002~~ ~~• located outside~~ **1 480-208/120V Maint. Bypass Xfmr** 060-EEP0-XFMR-00001 • **160 kVA** **2 208/120V Distribution Panel** EEN0-PL-00051 EEP0-PL-00001 **1 UPS Distribution Panel** EEP0-PL-00002 **1 75 kVA Dist Xfmr** 480-208/120V EEN0-XFMR-00051							2.9% of all such equipment • 2 points

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1007 (Electrical Room) (Continued)	**1 480-208/120V Maint. Bypass Xfmr** 060-EEP0-XFMR-00002 **2 480/277V Ltg. Panel** EUL0-PL-00001 EUL0-PL-00002 **2 160kVA UPS** EEP0-UJX-00001 EEP0-UJX-00002 **2 DCMIS** **2 PLC Panels**							
1007A (Battery Room)	1 125 V DC Battery 060-EEP0-BTRY-00002 1 250 V DC Battery 060-EEP0-BTRY-00001							
1008 (Electrical Room)	**480V Load Center** EEE0-LC-00001 • **2 cabs** **480V MCCs** EEE0-MCC-00001 • **10 cabs** **1 13.8 kVA / 480V Xfmr** EEE0-XFMR-00001 **1 208/120V Distribution Panel** EEE0-PL-00003 **1 75 kVA Dist Xfmr 480-208/120V** EEE0-XFMR-00003 **1 480/277V LP** EUL0-PL-00001-A **1 480-208/120V Bypass Xfmr** 060-EEU0-XFMR-00001 **1 120V UPS Panel** 060-EEU0-PL-00001 **1 208/120V UPS** 060-EEU0-UJX-00001 **2 DCMIS** **2 PLC Panels**	2 Fan coil units 060-VCT0-FCU-00001 060-VCT0-FCU-00002 • **20 hp(ea.)**						2.9% of all such equipment • 2 points

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1008A (Battery Room)	1 125 V DC Battery 060-EEU0-BTRY-00001							
1009 (HVAC Room)		2 HEPA Filter Units (hpn/a) 060-VCT0-FLT-00005 060-VCT0-FLT-00006 2 Exhaust Fan 060-VCT0-EXH-00005 060-VCT0-EXH-00006 • 5 hp(ea.)			Portable Welding Receptacle – WWF = 5 point			2.9% of all such equipment • 2 points
1010 (HVAC Room)		2 Air Handling Units 060-VCT0-AHU-00009 060-VCT0-AHU-00010 • 75 hp(ea.)						2.9% of all such equipment • 2 points
1011 (HVAC Room)		3 HEPA Filter Units (hpn/a) 060-VCT0-FLT-00009 060-VCT0-FLT-00010 060-VCT0-FLT-00011 1 Exhaust Fan 060-VCT0-EXH-00009 • 200 hp						2.9% of all such equipment • 2 points
1012 (Maintenance Room N)			~~Maintenance Room Door~~ ~~○ 2 hp~~					
1013 (Operations Room)	**Control Consoles – 12** **Equipment Racks – 4**						10% of all such equipment 1 point	
1013A (Operations Supervisor Room)								
1014 (WP Loadout Vestibule)		2 Fan coil units 060-VNI0-FCU-00001 060-VNI0-FCU-00002 • 15 hp(ea.)	~~2 WP Loadout Vestibule Doors~~ ~~• 1 motor each @ 5 hp~~					1.5% of all such equipment • 1 point

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1015 (WP Loadout Room)	WP Handling Crane 060-HMP0-CRN-00001 1 electrical panel	2 Air Handling Units 060-VCT0-AHU-00013 060-VCT0-AHU-00014 **50 hp(ea.)**	WP Handling Crane 060-HMP0-CRN-00001 • 4 motors: 60, 45, 7.5, & 20 hp • 132.5 hp • 105 kVA 2 WP Transfer Carriage Docking Stations 060-HL00-75-00001 & 2 • 30 hp (ea.) • 30 kVA (ea.) ~~2 WP Loadout Platforms~~ ~~060-HL00-PLAT-00001~~ ~~060-HL00-PLAT-00003~~ ~~• 1 motors (ea.)~~ ~~• 2 hp~~ ~~• 2 kVA (ea.)~~ ~~WP Loadout Platforms~~ ~~060-HL00-PLAT-00002~~ ~~• 2 motors~~ ~~• 4 hp~~ ~~• 4 kVA~~ 2 WP Loadout Vestibule Shield Doors 060-CR00-DR-00005 060-CR00-DR-00006 • 10 hp (ea.) • 10 kVA 30% each WP Transfer Trolleys, 2 060-HL00-TRLY-00001 1018 060-HL00-TRLY-00002 1019 • 2 motors @ 75 & 30 hp x **2** x RWF 1.2 • 150 kVA (ea.) 105 hp (ea.)					2.9% of all such equipment • 2 points

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1016 (Unassigned)								
1017 (Canister Staging Area #1)								
1018 (WP Positioning Room North)			70% WP Transfer Trolley 060-HL00-TRLY-00001 1015 • 2 motors @ 75 & 30 hp x RWF 1.4 • 150 kVA • 105 hp Shield Door 060-CR00-DR-00003 • 1 motor • 15 hp					1.5% of all such equipment • 1 point
1019 (WP Positioning Room South)			70% WP Transfer Trolley 060-HL00-TRLY-00002 1015 • 2 motors @ 75 & 30 hp x RWF 1.4 • 150 kVA • 105 hp Shield Door 060-CR00-DR-00004 • 1 motor @ 15 hp					1.5% of all such equipment • 1 point
1020 (Unassigned)								
1021 (Canister Staging Area #2)								
1022 (Canister Staging Area #3)								

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1023 (Cask Unloading Room North)			5% in 1023 Cask Transfer Trolley 060-HM00-TRLY-000011026 • 1 power drive x RWF 0.05 • 5 hp Shield Door 060-CR00-DR-00001 • 1 motor @ 15 hp					1.5% of all such equipment • 1 point
1024 (Cask Unloading Room South)			5% in 1024 Cask Transfer Trolley 060-HM00-TRLY-00002 1026 • 1 power drive x RWF 0.05 • 5 hp Shield Door 060-CR00-DR-00002 **1 motor @ 15 hp**					1.5% of all such equipment • 1 point
1025 (Canister Staging Area #4)								

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1026 (Cask Preparation Room)	Cask Handling Crane 060-HM00-CRN-00001 1 electrical panel		Cask Preparation Platform 060-HMH0-PLAT-00001 • 8 motors @ 5 hp • 40 kVA • 40 hp ~~Cask Handling Yoke~~ ~~060-HM00-BEAM-00001~~ ~~• 2 hp~~ Cask Handling Crane 060-HM00-CRN-00001 • 4 motors @ 90, 45, 7.5, & 30 hp • 120 hp • 140 kVA **Mobile Access Platform** 060-HMC0-PLAT-00001 • 44 kVA • 6 ~~+ 4~~ motors ~~• 4 @ 1 hp~~ **• 4 @ 5 hp** **• 2 @ 10 hp** ~~2 Site Transporter Doors~~ ~~• 2 motors each @ 3 hp~~ ~~Cask Prep. Room Door~~ ~~• 1 motors @ 2 hp~~ 95% each in 1026 Cask Transfer Trolleys, 2 power drives (1/ea) 060-HM00-TRLY-00001 1023 060-HM00-TRLY-00002 1024 • 2 power drives × RWF 1.9 5 hp (ea.)			90% Site Transporter 1027 • 90 units 40% Site Prime Mover • 40 units Split with rooms 1036 and 1036A		5.9% of all such equipment • 4 points
1027(Site Transporter Vestibule)		2 Fan coil units 060-VNI0-FCU-00003 060-VNI0-FCU-00004 **• 20 hp(ea.)**	2 Site Transporter Vestibule Doors • 5 kVA (each) • 1 motor each @ 5 hp		Portable Welding Receptacle – WWF = 5 points	10% Site Transporter 1026 • 10 units		

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1028 (Maintenance Room)	**480V Load Center** EEN0-LC-00003 • **5 cabs** **480V MCCs** EEN0-MCC-00013 • **9 cabs**	**2 Fan coil units** 060-VCT0-FCU-00005 060-VCT0-FCU-00006 **25 hp(ea.)**	**2 Chilled Water Pumps** 060-PSC0-P-00001A 060-PSC0-P-00001B • **1 motor (ea.)** • **100 hp(ea.)** **Hot Water Pump** 060-PSH0-P-00001A • **1 motor** • **25 hp** **Hot Water Pump** 060-PSH0-P-00001B • **1 motor** ○ **25 hp**		Primary Welding Station 400 points			
1029 (Electrical Room)	**480V Load Center** EEE0-LC-00002 • **2 cabs** **480V MCCs** EEE0-MCC-00002 • **10 cabs** **1 13.8 kVA / 480V Xfmr** EEE0-XFMR-00002 **1 208/120V Distribution Panel** EEE0-PL-00004 **1 480-208/120V Dist Xfmr** EEE0-XFMR-00004 **1 480/277V Lighting Panel** EUL0-PL-00001-B **1 480-208/120V 40 kVA Maint. Bypass Xfmr** 060-EEU0-XFMR-00002 **1 208/120V UPS Panel** 060-EEU0-PL-00002 **1 208/120V 40 kVA UPS** 060-EEU0-UJX-00002 **2 DCMIS** **2 PLC Panels**	2 Fan coil units 060-VCT0-FCU-00003 060-VCT0-FCU-00004 **20 hp(ea.)**						2.9% of all such equipment • 2 points
1029A (Battery Room)	1 125 V DC Battery 060-EEU0-BTRY-00002							

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1030 (HVAC Room)		2 HEPA Filter Units (hpn/a) 060-VCT0-FLT-00007 060-VCT0-FLT-00008 2 Exhaust Fans 060-VCT0-EXH-00007 060-VCT0-EXH-00008 **5 hp(ea.)**						2.9% of all such equipment • 2 points
1031 (HVAC Room)		2 Air Handling Units 060-VCT0-AHU-00011 060-VCT0-AHU-00012 **75 hp(ea.)**						2.9% of all such equipment • 2 points
1032 (HVAC Room)		3 HEPA Filter Units (hpn/a) 060-VCT0-FLT-00012 060-VCT0-FLT-00013 060-VCT0-FLT-00014 1 Exhaust Fan 060-VCT0-EXH-00010 **200 hp**						2.9% of all such equipment • 2 points
1033 (Maintenance Room S)			~~Maintenance Room Door~~ ~~• 2 kVA~~ ~~2 hp~~					
1034 (Gas Sampling Room)			~~Cask Cavity Gas Sampling System~~ ~~060-MRE0-DET-00001~~ ~~1 motor @ 2 hp~~					
1035 (HVAC Room)		2 HEPA Filter Units (hpn/a) 060-VCT0-FLT-00017 060-VCT0-FLT-00018 2 Exhaust Fans 060-VCT0-EXH-00013 060-VCT0-EXH-00014 **15 hp(ea.)**						2.9% of all such equipment • 2 points
1036 (Trans. Cask Vestibule)		2 Fan coil units 060-VNI0-FCU-00005 060-VNI0-FCU-00006 **10 hp(ea.)**	~~Transportation Cask Vestibule Door~~ ~~2 hp~~			37% Site Prime Mover • 37 units Split with rooms 1026 and 1036A		
1036A (Vestibule Annex)		2 Fan coil units 060-VNI0-FCU-00007 060-VNI0-FCU-00008 **10 hp(ea.)**	~~Vestibule Annex Door~~ ~~• 2 kVA~~ ~~2 hp~~			23% Site Prime Mover • 23 units Split with rooms 1026 and 1036		

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1036B (Personnel Vestibule)								
1037 (South Maintenance Vestibule)			~~2 South Maint. Vest. Doors~~ ~~• 2 kVA (ea.)~~ ~~2 hp~~					
1038 (Stair #1)								
1039 (Stair #2)								
1040 (Stair #3)								
1041 (Stair #4)								
1042 (Stair #5)								
1043 (Stair #6)								
1044 (Personnel Elevator)			5000 lb Passenger Elevator • 50 kVA 1 motor					
1044A (Elevator Mechanical Room)								
1045 (Corridor)								
1046 (Elevator Lobby)								
1047 (Freight Elevator – North)			20 Ton Freight Elevator • 100 kVA • 1 motor ~~2 Freight Elevator Doors~~ ~~1 motor each @ 2hp~~					
1047A (Vestibule)			~~Freight Elevator Vestibule Door~~ ~~1 motor @ 2 hp~~					
1048 (Elevator Lobby)			~~Freight Elevator Lobby Door~~ ~~1 motor @ 2 hp~~					
1049 (Freight Elevator South)			20,000 lb Freight Elevator • 100 kVA • 1 motor ~~2 Freight Elevator Doors~~ ~~1 motor each @ 2 hp~~					
1049A (Vestibule)			~~Vestibule Door~~ ~~• 2 kVA~~ ~~1 motor @ 2 hp~~					
1050 (Elevator Lobby)			~~Elevator Lobby Door~~ ~~1 motor @ 2 hp~~					
1051 (Fire Water Riser Valve Room #1)								
1052 (Fire Water Riser Valve Room #2)								

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Table F5.4-1. Ignition Source Population by Room (Continued)

Ignition Source / Room Number	Electrical Equipment	Mechanical/ Electrical HVAC Equipment	Mechanical Process Equipment	Heat Generating Process Equipment	Torches, Welders, Burners	Internal Combustion Engines	Office/Kitchen Equipment	Portable and Special Equipment
1053 (Fire Water Riser Valve Room #3)								
1054 (Fire Water Riser Valve Rm #4)								
1201 (Women's Locker/Shower/Restroom)		~~Exhaust Fan 060-VNI0-EXH-00002 0.5 hp~~						
1202 (Security Post)							10% of all such equipment 1 point	
1203 (RP Staff Work Room)							10% of all such equipment 1 point	
1204 (Briefing Room)							10% of all such equipment 1 point	
1205 (Men's Locker/Shower/Restroom)		~~Exhaust Fan 060-VNI0-EXH-00001 0.5 hp~~						
1206 (Janitor Closet)								
1207 (Break Room)							10% of all such equipment 1 point	
1208 (Vending Room)							10% of all such equipment 1 point	
1209 (Entrance Lobby)								
1210 (Entry/Exit Vestibule)								
1211 (RP Lab / Count Room)							10% of all such equipment 1 point	
1212 (Decontamination Room)								
1213 (Vestibule In/Out)								
1214 (RA Control Point)								
1215 (RP Lab/Count Room)							10% of all such equipment 1 point	