5.2.16 *wafer seating plane* — the bottom surface of an ideally rigid flat disk that meets the diameter specification for 450 mm wafers, with negligible droop due to gravity, as it rests on the wafer supports.

5.2.17 *wafer set-down volume* — the open space for inserting and setting down a wafer in the cassette.

6 Reference Planes (HP, FP, BP) Specification

6.1 The HP, FP, and BP as described in the definition section are ideal planes, which are intended to be used to depict the position of certain features relatively to these planes. These planes are at position zero (*x*, *y*, *z*) with no tolerance associated, since these ideal planes do not represent a physical feature.

NOTE 3: The top surfaces of the KCPs are not the surfaces on which the carrier rests. Appendix 1 shows how test fixtures can be made to rest on the KCPs to duplicate the position of a carrier.

6.2 FP and BP are defined as vertical planes and ideally are parallel to the gradient of the gravity field. All three planes are mutually perpendicular. Only positive numbers are used to define coordinates within this system of three planes. No negative numbers are used in order to be as close as possible to standard mechanical drawing practices. Necessary clarification on the position of a feature usually will be achieved via figures.

NOTE 4: For best understanding, the definitions of the reference planes should be read in the order HP, BP, FP.

6.3 *Reference Baselines* — One centerline (CL) is defined:

- CL for the carrier door. It passes through the centers of the openings for the door pins. All the z-dimensions of door features are symmetric to the CL.

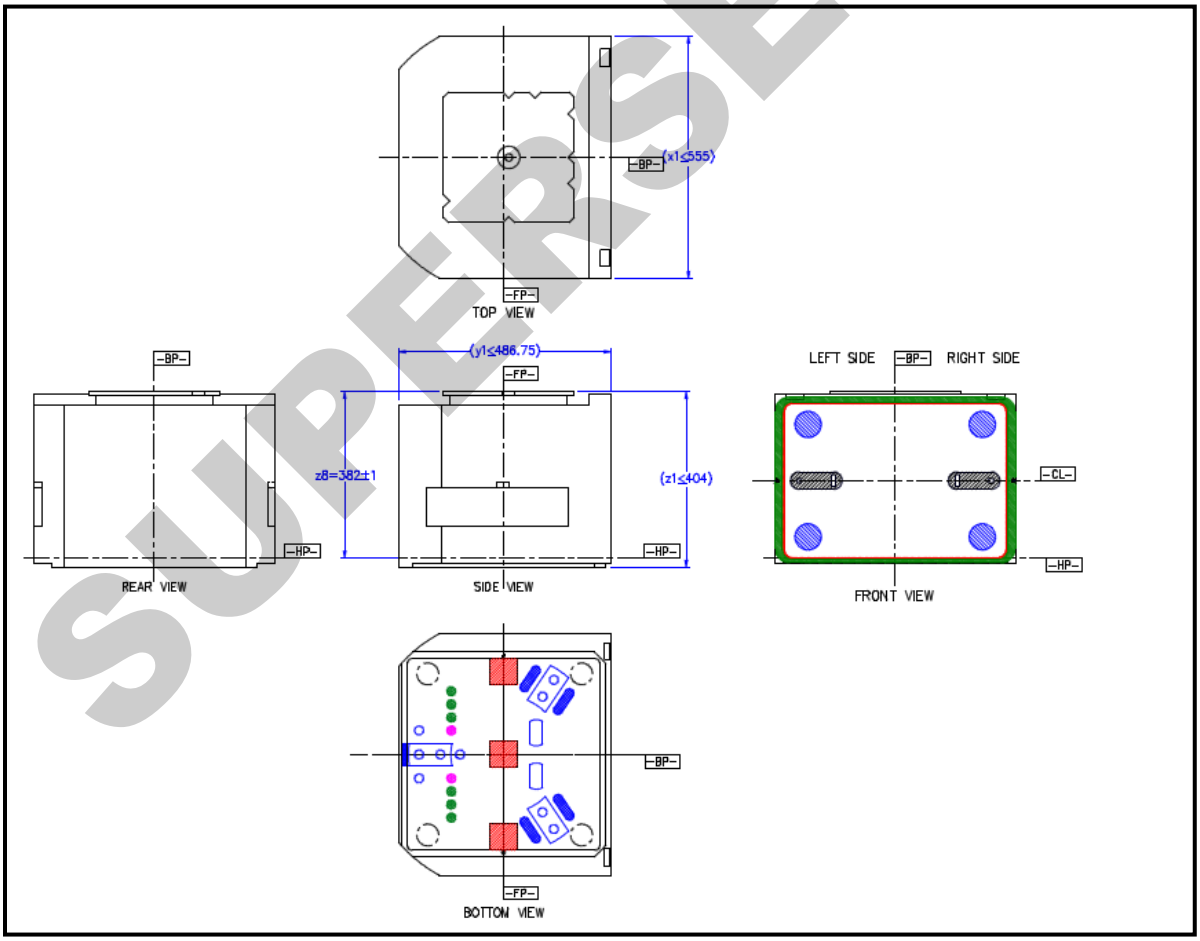

Figure 1
Overall Views of 450 FOUP

7 Requirements for Carrier Envelope

7.1 The overall dimensions of the 450 FOUP, *(x1), (y1), and (z1),* are given as reference dimensions because they are derived from other dimensions. See Table 2.

- $(x1) \leq x2 + x2$
- $(y1) \leq y2 + y4_{max}$
- $(z1) \leq z8_{max} + z11$

8 Requirements for Features for Automated Handling

8.1 *Automation Flange* — On top of the 450 FOUP is an automation flange for manipulating the carrier. See Figure 2 (top view) and Figures 3, 4 and 5 (sections).

8.1.1 The automation flange shall be centered in front of the FP. Its orientation and location are constrained by *x4* and *y12*. See Figure 6.

8.1.2 The center of the flange is located *x63* and *y54* relative to its side and front respectively. The flange shall have a centering feature at its center. The centering feature shall have a depth of *z2,* diameter of *d3* at the top surface, and *(d2)* at the bottom. The side of the centering feature shall have an angle of *θ4*.

8.1.3 The flange shall extend back from its front side by *y3*, and shall extend from its right side (as viewed from the front of the carrier) to the opposite side by *x3*. The neck below the flange shall extend *x34* to each side of the BP, and shall extend *y37* in front of the FP and *y56* behind the FP.

8.1.4 The flange has a pattern of notches on all sides. Notches on the front and back have a depth of *y31* and those on the sides shall have a depth of *x56*. The notches shall have an angle of *θ5*. The four corners shall have chamfers with size of *x32* and *y28*. Notches are located at *x30*, *x31*, *x63* on the front and *x33* on the back, and at *y29* on the right side and at *y54* on both the right and left sides. The flange shall have a thickness of *z13*, and the carrier shall have no obstructions around the flange for a height of *z9*, except for the door frame as shown by *y30* in Figure 4.

8.1.5 The presence sensing feature on the top surface of the automation flange consists of an area bounded by *d3* and *d8*. The feature is designed to provide a flat surface for presence sensing and is located *z8* above the HP.