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# Memorandum

TO: WILLIAM FERGUSON | CITY OF NEWTON, MA  
FROM: PHILIP EASH-GATES AND LUCY METZ | SYNAPSE ENERGY ECONOMICS  
DATE: JULY 17, 2023  
RE: NEWTON BERDO BUILDINGS LIST DEVELOPMENT

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## Summary

Synapse is working for the Newton Climate and Sustainability Team to support the implementation of BERDO. Our first task was to develop a replicable, well-documented method for determining which buildings should be regulated by BERDO. Here, we summarize which buildings the ordinance covers, describe the steps we used to create the list of covered buildings, and present preliminary analysis of the building list.

Using 2023 data, there are 356 buildings in Newton that BERDO will regulate. The covered buildings have a combined floor area of 22.7 million square feet, which is 16 percent of the total building floor area in Newton, and belong to 206 distinct owners. The three entities with the most covered buildings are Boston College (40 buildings), the City of Newton (34 buildings), and Lasell University (20 buildings).

## Criteria for Covered Buildings

Whether BERDO will regulate emissions from a building will depend on its gross floor area (GFA). With a few exceptions, discussed below, BERDO will cover all individual buildings with GFA greater than or equal to 20,000 square feet. Details by building type are listed below and summarized in Figure 1.

- **Residential and non-residential buildings:** The ordinance will cover all buildings with GFA that equals or exceeds 20,000 square feet.
- **Government buildings:** The ordinance will cover city buildings. Other government buildings (county, state, and federal) will be exempt.
- **Building portfolios:** Owners of more than one covered building may apply for a blended emissions standard for all buildings in the portfolio.
- **Campuses:** Campus buildings will be considered individually, and the ordinance will cover only those buildings with footprints of at least 20,000 square feet. For any district energy systems or campus central plants that serve both covered and non-covered

buildings,<sup>1</sup> Synapse recommends that Newton calculate the emissions intensity of steam generated at the central plant. Covered buildings would need to be metered individually to assess the emissions attributable to each one. Alternatively, owners of campuses may apply to include all campus buildings (including those less than 20,000 square feet) within a building portfolio; if all buildings on a central plant are included in a single, approved building portfolio, individual buildings do not need to be metered separately for central plant energy use.

- **Condominiums:** Residential condominiums will be exempt. Non-residential condominiums will be included based on total building square footage, rather than the area of individual units.
- **Exempt properties:** There are three types of properties that Boston’s ordinance covers but that Newton plans to exempt. These include (1) residential buildings with 15 or more units but GFA less than 20,000 square feet, (2) multiple buildings located on the same parcel whose individual areas are each less than 20,000 square feet but whose collective area is greater than 20,000 square feet, and (3) portfolios of buildings—buildings with the same owner that are located on different parcels—whose individual areas are each less than 20,000 square feet but whose collective area is at least 20,000 square feet.

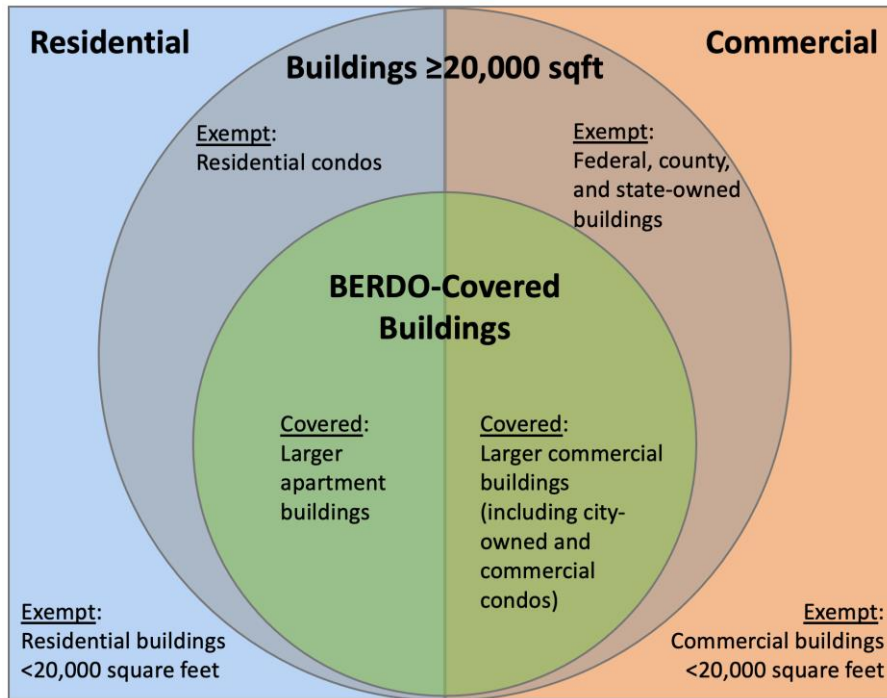
Implementation of Newton BERDO will take place in stages. Buildings will be divided into five implementation tiers based on their size and type (residential or non-residential), and each tier will have a different start date for compliance. See Table 3 for a description of the buildings included in each tier.

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<sup>1</sup> The Boston College central steam plant is located in Newton, but serves buildings in both Newton and Boston. According to the [International District Energy Association](#), the former Andover Newton Theological School campus also has a district heating system, which we recommend investigating further.



Figure 1: Summary of BERDO coverage by building type



## Definition of Gross Floor Area

To determine which Newton buildings will be covered by BERDO, we first established a detailed definition of the GFA that the ordinance applies to. We aligned our definition to Energy Star Portfolio Manager, a benchmarking tool for building emissions and water and energy use developed by the U.S. EPA. In general, ESPM defines GFA as all area within the “outside surface of the exterior walls of the building.”<sup>2</sup> Table 1 shows an abbreviated list of area types that the ESPM definition includes and excludes, and supplementary Table 4 contains additional details.

<sup>2</sup> Energy Star Portfolio Manager Glossary. Available at: <https://portfoliomanager.energystar.gov/pm/glossary>.

Table 1: Summary of the floor area types used to determine BERDO coverage

Included in GFA	Excluded from GFA
<ul style="list-style-type: none"> <li>Interior living spaces</li> <li>Storage areas</li> <li>Basements (unfinished or finished)</li> <li>Finished attics</li> <li>Stairwells and elevator shafts</li> <li>Storage rooms</li> <li>Mechanical equipment rooms</li> </ul>	<ul style="list-style-type: none"> <li>Unfinished attics</li> <li>Parking (driveways, garages)</li> <li>Patios, decks, and porches</li> <li>Exterior loading docks</li> <li>Cabanas, sheds, and other detached structures</li> <li>Crawl spaces and the interstitial plenum space between floors</li> </ul>

Source: Portfolio Manager [Glossary](#), [FAQ](#), and Synapse communication with U.S. EPA's technical consultant

## Process for Building List Development

### Data from the Assessor's Office

We started with two datasets from the Newton Assessors' Office: a parcel dataset and an area code<sup>3</sup> dataset. Both datasets are current as of July 1, 2023. The building list will need to be updated every year to account for additions, demolition, and new construction. Data for 2024 will be available July 1, 2024.

The parcel dataset contains information about each parcel of land in Newton. Key variables include:

- ID number:** The dataset lists both the parcel ID (PID) and section-block-lot number (SBL), which city offices use to uniquely identify each parcel.
- Street address**
- Owner:** Contact information for the current owner.
- Use code:** The use code indicates the parcel's property tax classification. Residential parcels have use codes that start with 1, commercial with 3, industrial with 4, golf courses with 8, tax exempt with 9, and multiple use with 0. The use code "995" estimates the total area in condominium complexes and is the only use code that gives a subtotal, meaning that the floor areas of condominium units are counted both under individual use codes and under a 995 total.
- Sequence number:** Each condominium complex has a unique sequence number. For non-condo parcels, this value is blank.
- Number of buildings located on parcel**
- Other information:** The parcel dataset contains a variety of other information, including sale price, heating fuel type, number of apartments, etc. Note that the gross area reported in the parcel database is *not* equivalent to the BERDO GFA.

<sup>3</sup> Area code refers to three-digit codes that correspond to different area types within or connected to a building. Examples of area types include: attic, basement, porch, garage, greenhouse, and deck.



The area code dataset lists the floor area in each building broken down by 104 area codes. To distinguish between multiple buildings located on the same parcel, it labels each entry with both a PID/SBL and a building ID number (BID). The area codes provide detailed information about the types of floor area in each building. We categorized each area code as included or excluded in the GFA, verifying our decisions with ESPM's technical consultant (Table 4).

Using the parcel dataset and area code dataset to develop the covered building list involves three broad steps: (1) assigning each building a unique ID, (2) calculating the covered GFA associated with that ID, and (3) assigning each covered building to an implementation tier. Condominiums and non-condo buildings must be processed separately.

### **Process for Non-Condo Data Analysis**

The steps to determine which non-condo buildings BERDO covers are as follows:

1. Using the area code dataset, assign each entry an identifier of "PID"- "BID". The composite identifier ensures that each building has a unique ID, even when there are multiple buildings on the same parcel.
2. Create a list of unique PID-BID identifiers and compare it to the parcel dataset. Remove any entry whose PID is associated with a sequence number. (Entries with sequence numbers are condominiums and need to be analyzed separately.) Also remove any entry with a negative BID; these buildings were deleted from the assessor's database at some point in the past. The remaining list of PID-BID identifiers contains a unique entry for every non-condo building in Newton.<sup>4</sup>
3. Using the lookup table of area codes (Table 4) and the area code dataset, sum the covered area associated with each building.
4. Filter for buildings with GFA greater than or equal to 20,000 square feet.
5. Review the list and remove any exempt government buildings. As of 2022, this includes one Middlesex County building, one Massachusetts Bay Transit Authority (MBTA) buildings, and nine University of Massachusetts buildings.<sup>5</sup> There are not currently any federal buildings of at least 20,000 square feet, but federal buildings constructed in the future would be exempt. The remaining entries in the list are the non-condo covered buildings.

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<sup>4</sup> Buildings under construction are listed in the tax assessor's database without sequence numbers, even if they may later become condominiums. For the purposes of developing the covered building list, we abided by the status of the building in the current tax assessor's database. BERDO coverage of these buildings is subject to change in future years' lists based on review of final construction documentation by the tax assessor's office.

<sup>5</sup> The assessors' database shows that an apartment complex on Washington St. (SBL 43045 0030Z) has three owners, including MBTA. Discussion with the Assessors' Office indicated that the property is owned by National Development, which has a 99-year lease with the MBTA. Based on our review with the Assessors' Office, we have included this building in the covered buildings.

6. Assign each building to one of the implementation tiers shown in Table 3, based on building square footage and type (residential or non-residential). To determine if a building is residential, look at the use code of the associated parcel. All parcels whose use codes start with 1 are residential. Parcels with use codes 9700, 970R, and 970C are also residential; these are properties owned by Newton Housing Authority. All other parcels are non-residential.

### **Process for Condo Data Analysis**

Condos require a different data analysis process because each unit is entered in the assessor's database with a separate PID, regardless of whether multiple units are located on the same parcel. In addition, the area in each condo complex is listed twice in the assessor's database; there are entries for the area of each individual unit and also an entry (with use code 995) that sums the total area in each complex. For example, a condo complex with two units would have three entries, one for each individual unit and one for the total area.

Units that belong to the same complex have the same sequence number. The division of units between buildings within a complex cannot be calculated from either the parcel or area code dataset and must be determined manually by the assessor's office. The steps to determine which condo complexes may contain covered buildings are as follows:

1. Create a list of all unique sequence numbers in the parcel dataset.
2. Sum the BERDO-covered GFA (from the area code dataset) for all PIDs associated with a given sequence number, excluding entries with use code 995 and entries with negative BIDs. Create separate totals for residential and non-residential area in each complex. To determine if a unit is residential or non-residential, look at the associated use code. Condo use codes follow the same pattern as non-condo parcels: Residential use codes start with 1 or are 9700, 970R, and 970C. Units with use code 947C may either be residential or non-residential and must be categorized manually. They will generally be consistent with other units in the same complex. As of 2022, there are only two units with use code 947C, both of which belong to the Newton Communications Access Center and are non-residential.
3. Compare the summed area from step two to the 995 area associated with each sequence number, and record the larger of the two values as the complex area. The 995 area represents total complex area, including common areas, whereas the summed area excludes common areas. As a result, the 995 area is usually more accurate, but taking the larger of the 995 and summed area provides a safeguard against irregularities in the 995 data.
4. For condo complexes with at least 19,000 square feet of non-residential area (which leaves a margin of error for possible omission of common spaces), the assessor's office will need to determine whether there are any buildings with 20,000 square feet or more of non-residential area.



5. For these buildings, manually assign a unique ID of “sequence number”-“building number” (where building number is 01, 02, etc., based on how many covered buildings are located in the complex) and implementation tier.
6. Assign each building to one of the implementation tiers shown in Table 3, based on building square footage and type (residential or non-residential). For buildings with residential and non-residential areas, assign the building based on the majority of GFA.

While there are over a thousand condominium complexes in Newton, there are currently only four with at least 19,000 square feet of non-residential space, leading to five covered buildings. Table 2 provides more detail about these complexes.

Table 2: Information about covered condominium buildings

Sequence Number	Description
780	The two commercial units in this complex are located in the same building and have combined area greater than 20,000 square feet, so the building is covered.
817	Unit 33-3 is a small standalone building and is not covered. The remaining six units are part of one large building that is covered.
1384	There are two four-story buildings in this complex. The bottom floors are commercial while the upper three floors are residential. This is a unique situation, because all three floors of apartments in both buildings are listed as one condo unit for administrative purposes. Since the residential units share a common owner, both buildings will be covered in their entirety. We assign this building to a residential implementation tier because the majority of the GFA is residential apartments.
1438	This complex consists of one non-residential building that is divided into three condominium units. In the 2023 tax assessor’s database, Temple Reyim is listed as the owner of all three units, but eventually ownership will be transferred to multiple entities. The units will likely share certain spaces in the building throughout the year.

## Results

There are currently 356 BERDO-covered buildings with a combined GFA of 22.7 million square feet, which is 16 percent of the total building GFA in Newton. Table 3 shows the breakdown of buildings by implementation tier. Figure 2 and Figure 3 show the distribution of buildings in Newton by size category. While the vast majority of buildings in Newton are less than 20,000 square feet, the BERDO-covered buildings account for an outsized proportion of GFA, since they are the largest buildings. Figure 2 shows data for all non-condo buildings while Figure 3 shows covered buildings only.

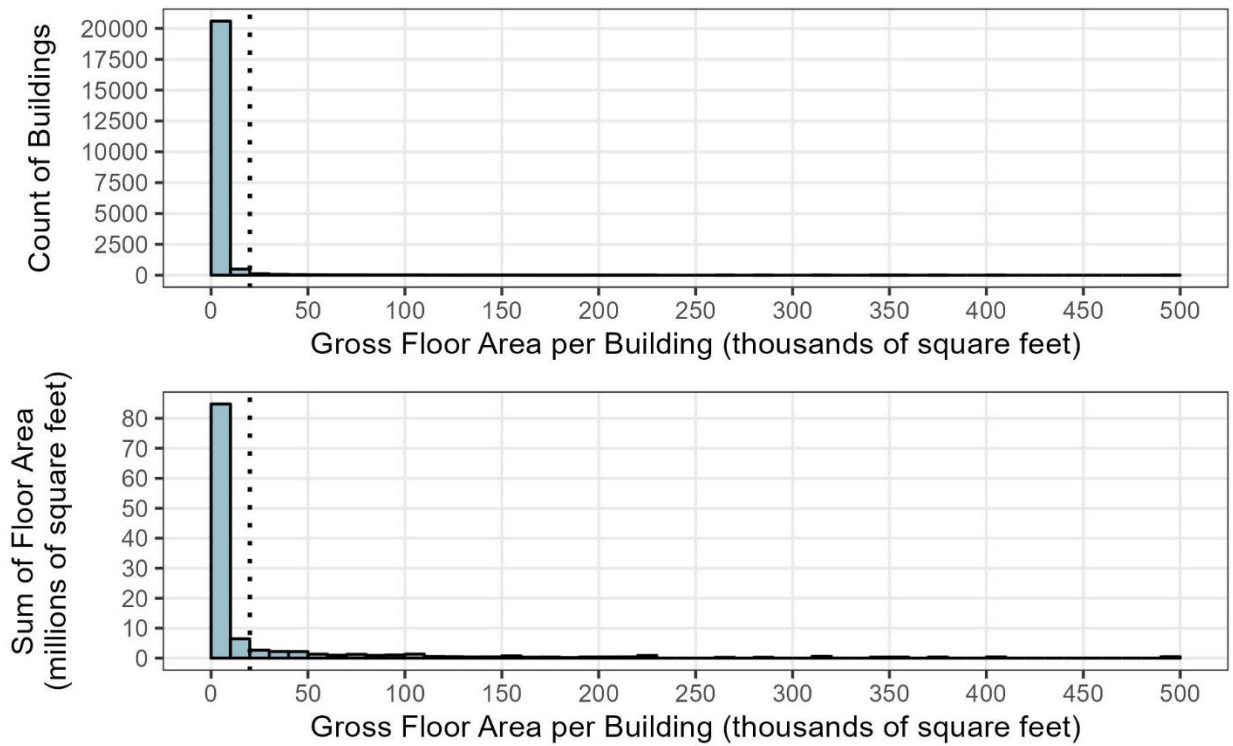
Table 3: Summary of covered buildings in each implementation tier

Tier	Description	Number of Buildings	Total GFA (sq ft)
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1	Non-residential, $\geq 100,000$ sq ft	47	8,631,279
2	Non-residential, 50,000–99,999 sq ft	71	5,030,622
3	Non-residential, 35,000–49,999 sq ft	68	2,872,039
	Residential, $\geq 50,000$ sq ft	17	2,109,835
4	Non-residential, 20,000–34,999 sq ft	109	2,913,377
5	Residential, 20,000–49,999 sq ft	44	1,167,832
<b>Total</b>	<b>All covered buildings</b>	<b>356</b>	<b>22,724,984</b>

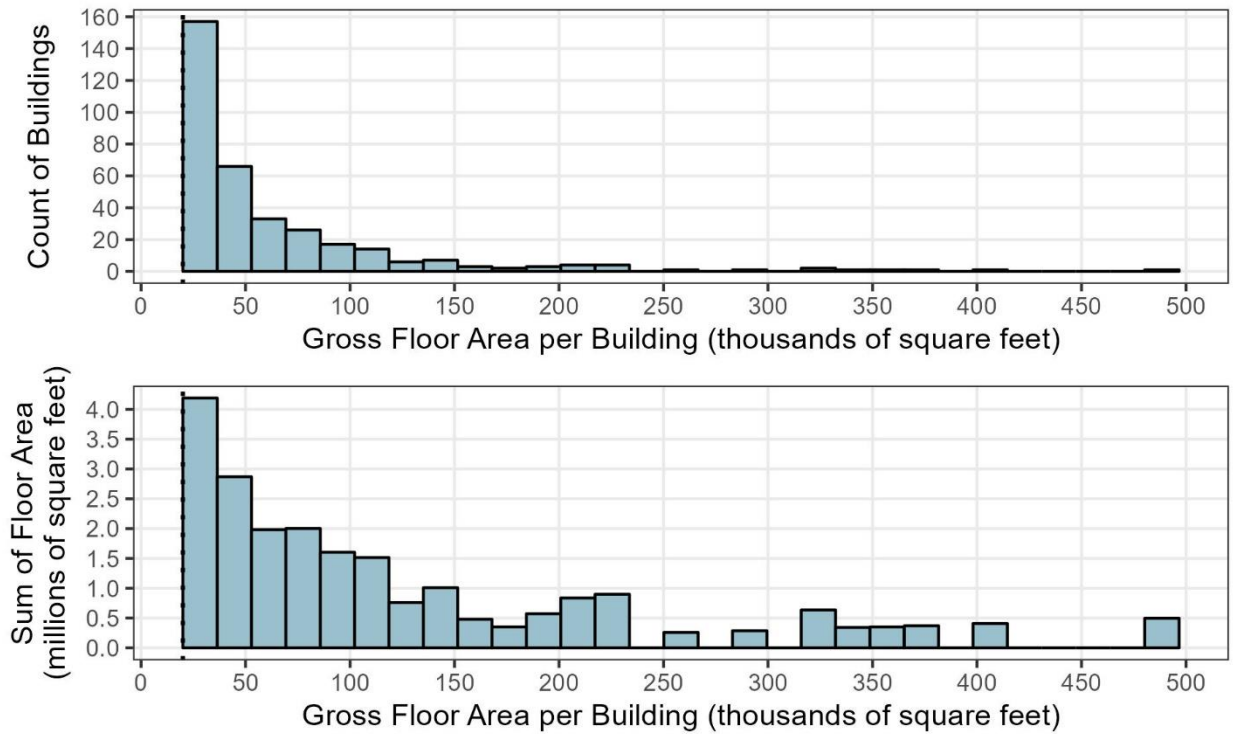
Figure 2: Number of buildings (upper panel) and total gross floor area (lower panel) in each building size category



The dotted line marks the area cutoff for BERDO. Figure omits condominiums, which account for about 9 percent of total building gross floor area in Newton.



**Figure 3: Number of buildings (upper panel) and total gross floor area (lower panel) in each building size category, for covered buildings only**



The dotted line marks the area cutoff for BERDO. Figure omits condominiums.

The covered buildings belong to 206 owners, 80 percent of whom own one covered building, 14 percent of whom own two to four buildings, and 3 percent of whom own five or more covered buildings. The remaining 3 percent own partial building (i.e., a condo unit within a covered building that does not include the entire building). In total, only eight out of the 206 obligated parties own condominiums; the remaining 198 own non-condo buildings.

The owners of five or more buildings are Boston College (40 buildings), the City of Newton (34 buildings), Lasell University (20 buildings), the Roman Catholic Archdiocese of Boston (seven buildings), the Chestnut Hill Shopping Center (six buildings), the Newton Housing Authority (five buildings), and the Donato D. Capasso Trust (five buildings).

## Supplementary Tables

Table 4: BERDO coverage of the 104 area codes in the assessor's database

<u>Code</u>	<u>Description</u>	<u>Covered?</u>
10S	10 Stories	Yes
AOF	Office, (Average)	Yes
APT	Apartment	Yes
AUG	Gas Station	No
AUR	Auto Repair	Yes
AUS	Auto Sales	Yes
BAS	First Floor	Yes
BAY	Bay	Yes
BL1	Basement Living 33%	Yes
BL2	Basement Living 25%	Yes
BL3	Basement Living 50%	Yes
BL4	Basement Living 75%	Yes
BL5	Basement Living 100%	Yes
BMC	Basement Commercial	Yes
BMR	Basement Retail	Yes
BMS	Commercial Bsmt Storage	Yes
BR1	Basement Recreation 33%	Yes
BR2	Basement Recreation 25%	Yes
BR3	Basement Recreation 50%	Yes
BR4	Basement Recreation 75%	Yes
BR5	Basement Recreation 100%	Yes
CA1	Commercial Finish Attic 10%	Yes
CA2	Commercial Finish Attic 25%	Yes
CA3	Commercial Finish Attic 50%	Yes
CA4	Commercial Finish Attic 66%	Yes
CA5	Commercial Finish Attic 75%	Yes
CA6	Commercial Finish Attic 90%	Yes
CAN	Canopy	No
CB1	Comm Finished Bsmt 25%	Yes
CB2	Comm Finished Bsmt 33%	Yes
CB3	Comm Finished Bsmt 50%	Yes
CB4	Comm Finished Bsmt 75%	Yes
CB5	Comm Finished Bsmt 100%	Yes
CDN	Canopy, detached	No
CLP	Loading Platform, Finished	No
COM	Commercial	Yes
CTH	Cathedral Ceiling	Yes

DCK	Deck	No
DRM	DORM	Yes
EAF	Attic, Finished 50%	Yes
EAU	Attic, Expansion, Unfinished	No
EEE	Enclosed Entry, Egress	Yes
FA1	Finished Attic 10%	Yes
FA2	Finished Attic 25%	Yes
FA3	Finished Attic 50%	Yes
FA4	Finished Attic 75%	Yes
FA5	Finished Attic 100%	Yes
FAT	Attic, Finished	Yes
FBM	Basement, Finished	Yes
FCB	Cabana, Enclosed, Finished	No
FCP	Carport	No
FDG	Garage, framed, detached	No
FDU	Utility, finished, detached	No
FEP	Porch, Enclosed, Framed	No
FGR	Garage, Frame	No
FHS	Half Story, Finished	Yes
FOP	Framed Open Porch	No
FSP	Porch, Screen, Framed	No
FST	Utility, Finished	Yes
FUS	Upper Story, Finished	Yes
GRN	Green House	No
H&A	Heating & A/C	Yes
IND	Industrial	Yes
ODK	Open deck	No
OQS	One Qrt Story	Yes
OVR	Overhang	No
PKG	Parking Garage	No
POL	Pool	No
PTO	Patio	No
RAN	Retail Anchor	Yes
REC	Rec Room	Yes
RFT	Refreshment Stand	Yes
RML	Retail Mall	Yes
RSF	Restaurant, Fast Food	Yes
RST	Restaurant	Yes



RTL	Retail, Large	Yes
RTS	Retail, Small	Yes
SDA	Store Display Area	Yes
SPA	Service Production Area	Yes
STP	Stoop	No
TQS	Three Quarter Story	Yes
UA1	Unfinished Attic 25% Area	No
UA2	Unfinished Attic 50% Area	No
UA3	Unfinished Attic 75% Area	No
UA4	Unfinished Attic 100% Area	No
UAT	Attic, Unfinished	No
UBM	Basement, Unfinished	Yes
UDG	Garage, unfinished, detached	No
UDS	Porch, screen, unfinished, detach	No
UDU	Utility, unfinished, detached	No

UEP	Porch, Enclosed, Unfinished	No
UFN	Unfinished Area	No
UGR	Garage, Under	No
UHS	Half Story, Unfinished	Yes
ULP	Loading Platform, Unfinished	No
UNK	Other	No
UOP	Porch, Open, Unfinished	No
USP	Porch, Screen, Unfinished	No
UST	Utility, Storage, Unfinished	Yes
UUS	Upper Story, Unfinished	Yes
WDK	Deck, Wood	No
WSD	Warehouse Distribution	Yes
WSI	Warehouse Industrial Support	Yes
WSS	Warehouse Storage	Yes

